



Service Manual

Drive Axle
190 & 290

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March 1998

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SPICER CLARK-HURTH

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GB

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INTRODUCTION

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The efficiency and continued operation of mechanical units depend on constant, correct maintenance and also on efficient repair work, should there be a break-down or malfunction. The instructions contained in this manual have been based on a complete overhaul of the unit. However, it is up to the mechanic to decide whether or not it is necessary to assemble only individual components, when partial repair work is needed. The manual provides a quick and sure guide which, with the use of photographs and diagrams illustrating the various phases of the operations, allows accurate work to be performed.

All the information needed for correct disassembly, checks and assembly of each individual component is set out below. In order to remove the differential unit from the vehicle, the manuals provided by the vehicle manufacturer should be consulted. In describing the following operations it is presumed that the unit has already been removed from the vehicle.

IMPORTANT: In order to facilitate work and protect both working surfaces and operators, it is advisable to use proper equipment such as: trestles or supporting benches, plastic or copper hammers, appropriate levers, extractors and specific spanners or wrenches.

Before going on to disassemble the parts and drain the oil, it is best to thoroughly clean the unit, removing any encrusted or accumulated grease.

INTRODUCTORY REMARKS: All the disassembled mechanical units should be thoroughly cleaned with appropriate products and restored or replaced if damage, wear, cracking or seizing have occurred.

In particular, thoroughly check the condition of all moving parts (bearings, gears, crown wheel and pinion, shafts) and sealing parts (O-rings, oil shields) which are subject to major stress and wear. In any case, it is advisable to replace the seals every time a component is overhauled or repaired. During assembly, the sealing rings must be lubricated on the sealing edge. In the case of the crown wheel and pinion, replacement of one component requires the replacement of the other one. During assembly, the prescribed pre-loading, backlash and torque of parts must be maintained.

CLASSIFICATION: This manual classifies units according to part numbers. For a correct interpretation, classification is indicated as follows:

_____ → = up to the part number

→ _____ = from the part number on

When no classification is given, disassembly and assembly operations are the same for all versions.

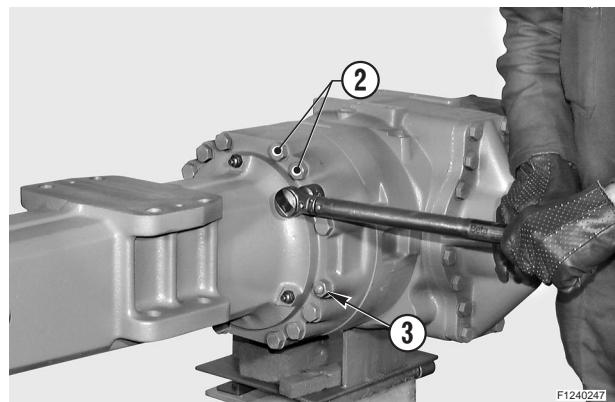
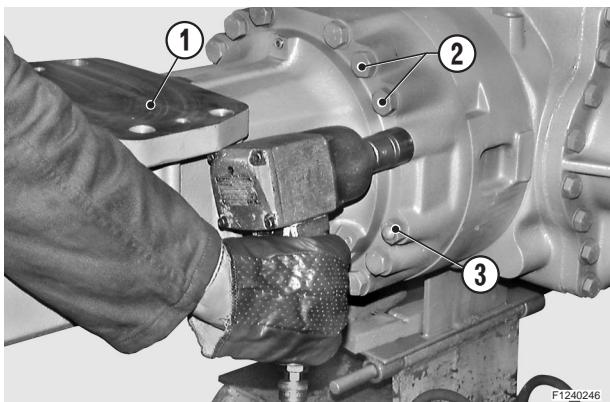
SPECIFIC EQUIPMENT AND SPARE PARTS: The drawings of all specific tools required for maintenance and repair work can be found at the end of this manual ; spare parts may be ordered either from the vehicle manufacturer or directly from the Service Centers or Authorised Distributors of SPICER CLARK-HURTH.



SPICER CLARK-HURTH

DRIVE AXLE TYPE

190

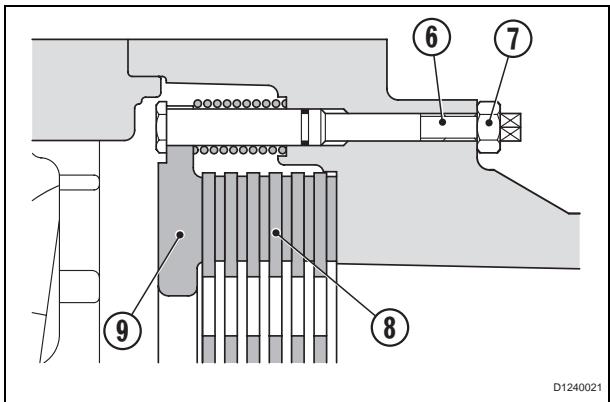


GB

a

Sling the arm (1) and put the rod under slight tension.
Unloose and remove screws (2), nuts (3) and the relative washers, (4) and (5).
Remove the arm, including the braking disks.

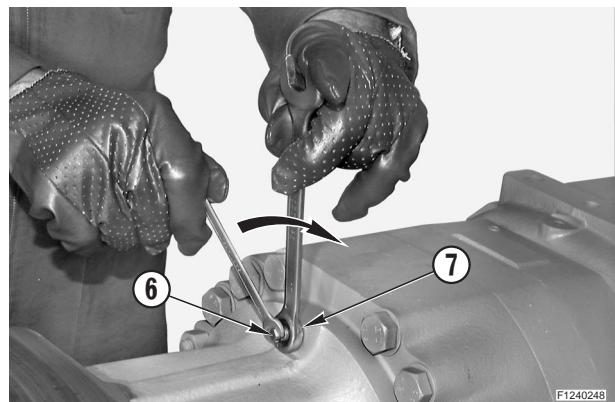
SLACK ADJUSTMENT FOR BRAKS



GB

c

Turn the adjusting screws (6) anti-clockwise, until the disk push device (9) is made to rest on the braking disks (8).
CAUTION! Turn the screws in an even way up to a max. torque of 10 Nm.
Before continuing, check that all screws have the same jut.



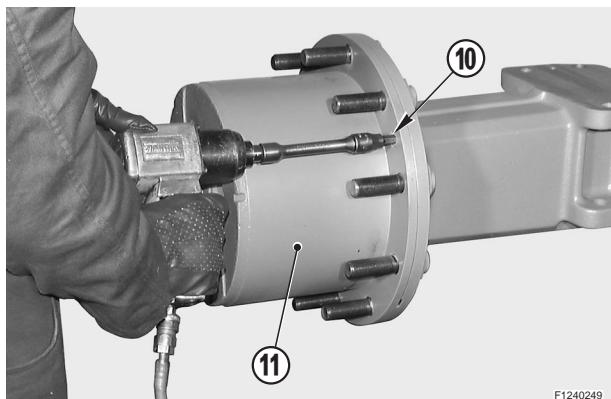
GB

d

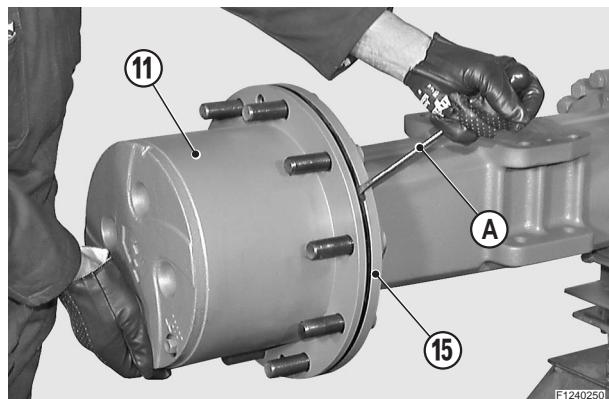
Turn the screws (6) one turn clockwise so as to obtain a slack of 1 mm between the disks.
Lock the nut (7) while keeping the screws (6) into position.
Torque wrench setting for nut: MAX. 15 Nm.



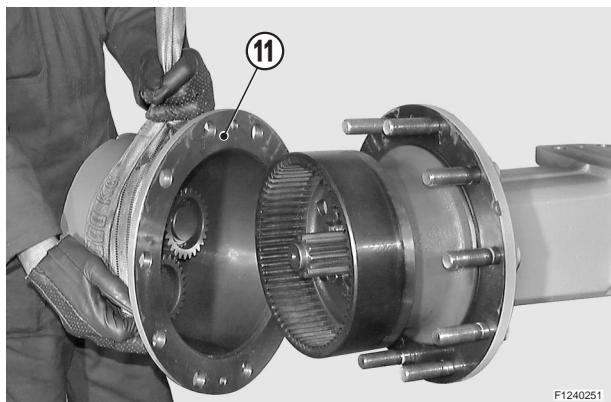
HOW TO DISASSEMBLE THE EPICYCLIC REDUCTION GEAR

**GB****a**

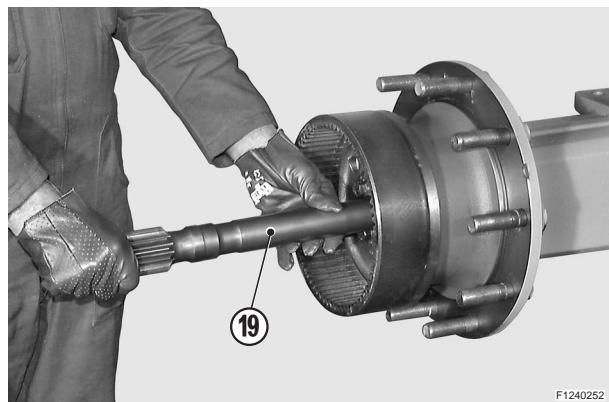
Remove the securing screws (10) from the spider cover (11).

**GB****b**

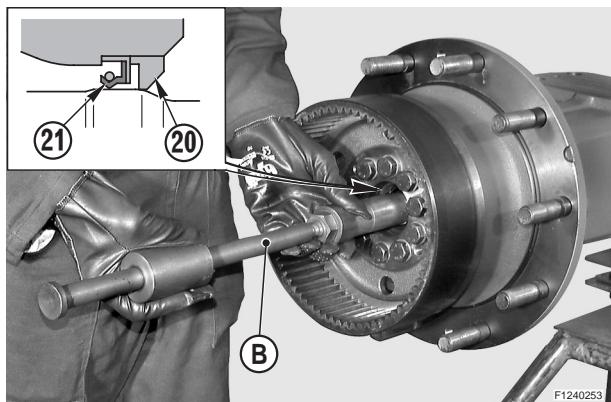
Disjoin the spider cover (11) from the hub (15) by alternately inserting a screwdriver "A" in the specific slots.

**GB****c**

Sling the whole spider cover (11) and remove it completely.

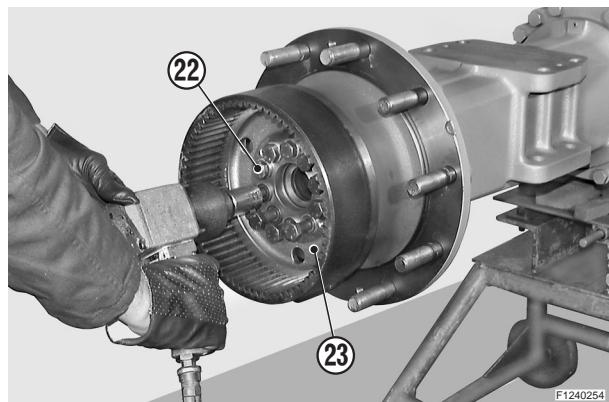
**GB****d**

CAUTION! If the axle (19) needs removing, introduce pressure into the braking circuit in order to lock the braking disks.
Extract the axle (19).

**GB****e**

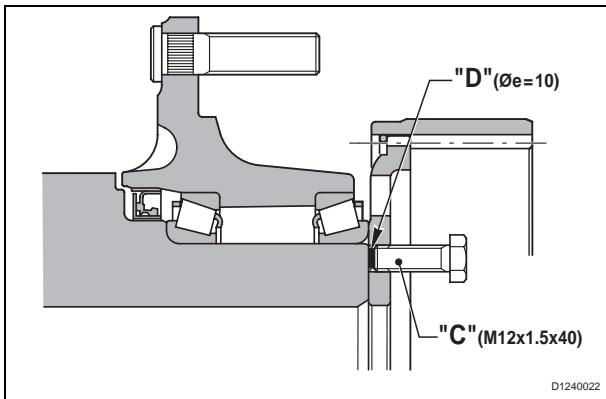
With the aid of an extractor "B", remove first the guide ring (20) then the sealing ring (21).

NOTE: Note down assembly side for the guide ring (20) and the sealing ring (21).

**GB****f**

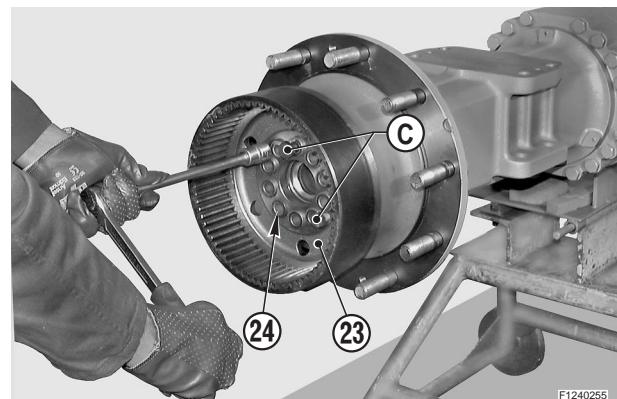
Unloose and remove the screws (22) of the crown flange (23).

NOTE: Leave a screw (22) in one of the top positions for safety's sake.

**a**

To extract the crown flange, insert two flat washers "D" ($\text{ø} = 10$) and screw down two "C" screws (M12x1.5x40) in the specific holes . Keep washers into position with grease.

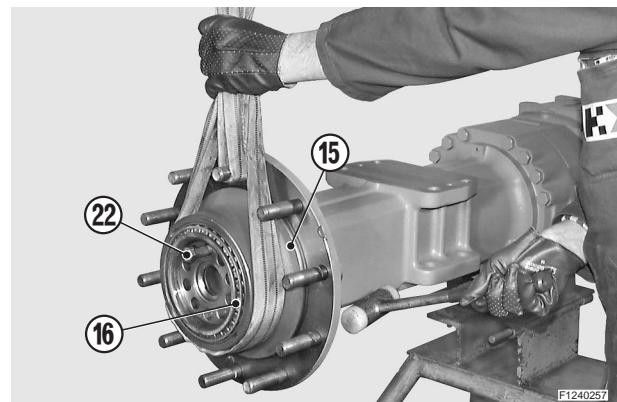
CAUTION! Be sure that the end of the threaded stem is perfectly flat. perfettamente piano.

**GB****b**

Alternately turn the two screws "C" one fourth turn, until the bushes (24) are released from the crown flange (23).

**GB****c**

Remove the screw (22) that has been left on for safety and remove the crown flange (23).

**GB****d**

Sling the entire hub (5) and extract the whole unit from the axle by using a plastic mallet.

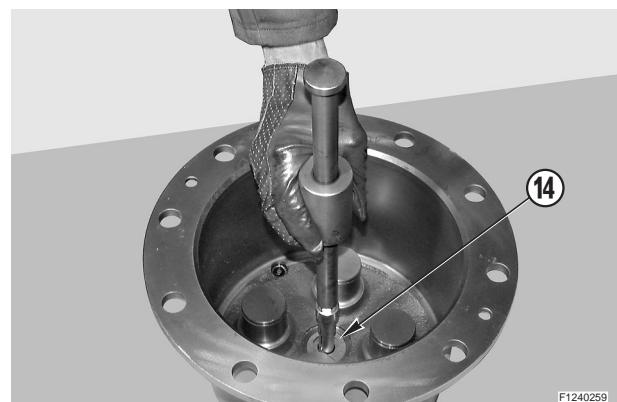
NOTE: Insert a screw (22) to prevent the bearing (16) from falling.

HOW TO DISASSEMBLE UNITS

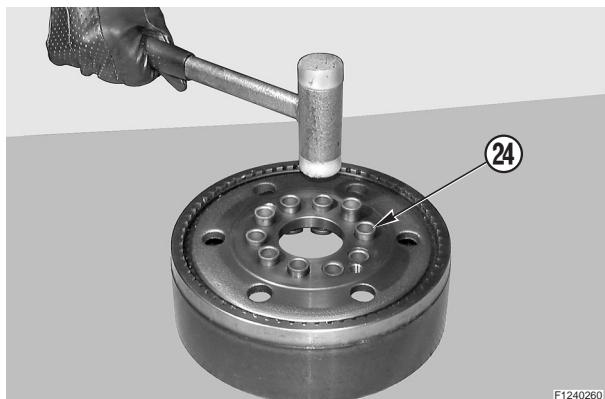
**GB****e**

Remove the elastic rings (12) and extract the planet wheel gears (13), including bearings, from the spider cover (11).

NOTE: Note down assembly side.

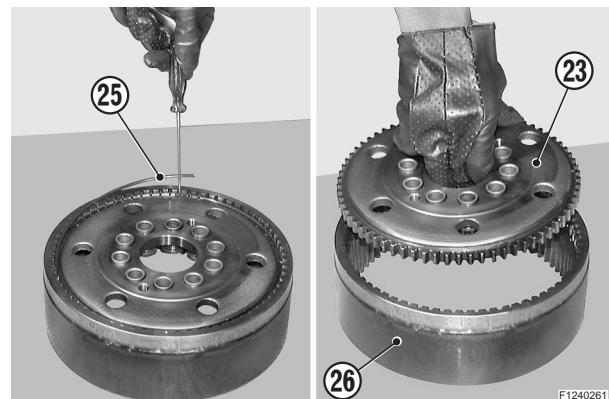
**GB****f**

Remove the shim-washer of the axle by using an extractor (14).

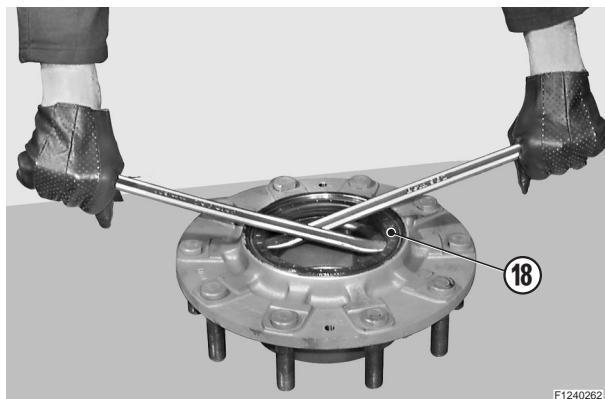

GB
a

Remove the bushes (24) if necessary, by using a plastic mallet (and a pushing device if the case may be).

NOTE: Partially extract the bushes (24) anyhow.

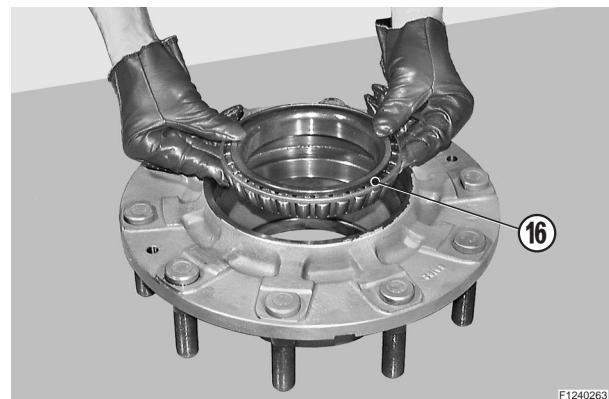

GB
b

Remove the elastic ring (25) and extract the flange (23).

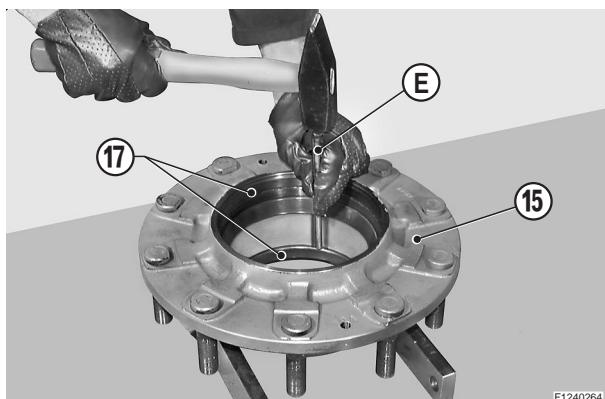

GB
c

Remove the sealing ring (18).

NOTE: Note down the assembly side.


GB
d

Remove the bearing (16).

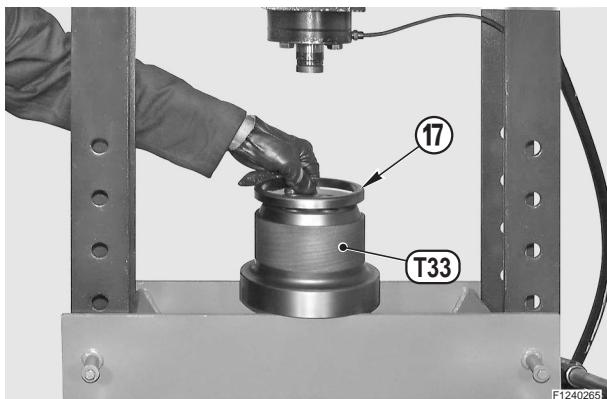

GB
e

Remove the external thrust blocks (17) from the bearings by inserting a pin-extractor "E" in the specific slots placed on the hub (15).

NOTE: Alternate hammering to prevent crawling and deformation of the thrust blocks.

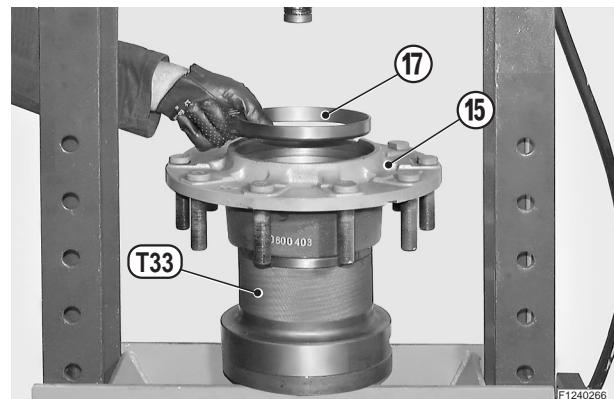

GB
f

NOTE: Clean out the seat of the sealing ring by removing any sealant residues with sealing effect (Ermetico).



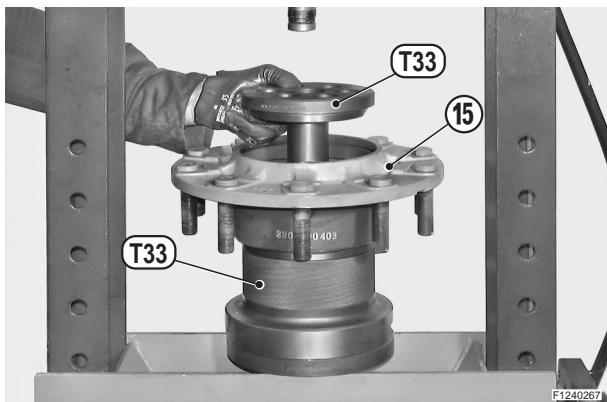
a

Position the lower part of fixture T33 and the external bearing thrust block (17) under the press.



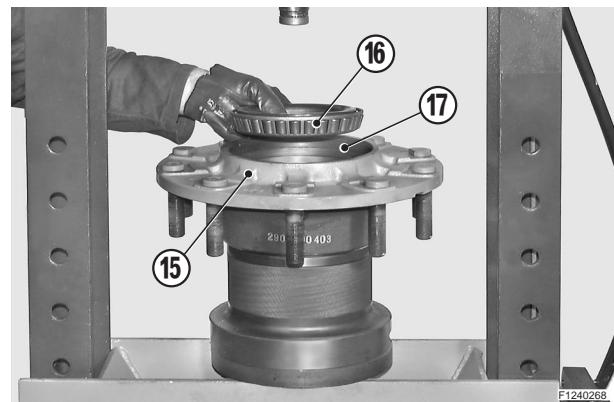
b

Lubricate the housings of the bearings and position the hub (15) on the fixture T33; position the internal bearing thrust block (17).
NOTE: Check the orientation of the thrust block.



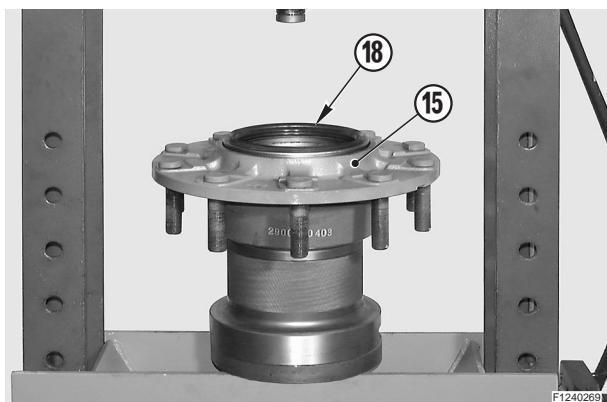
c

Position the top part of fixture T33 and push the thrust blocks (17) all the way into the wheel-carrier hub (15).



d

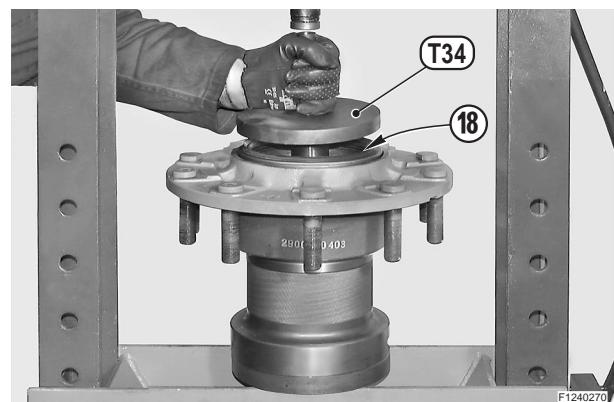
Install the bearing (16) in the thrust block (17).



e

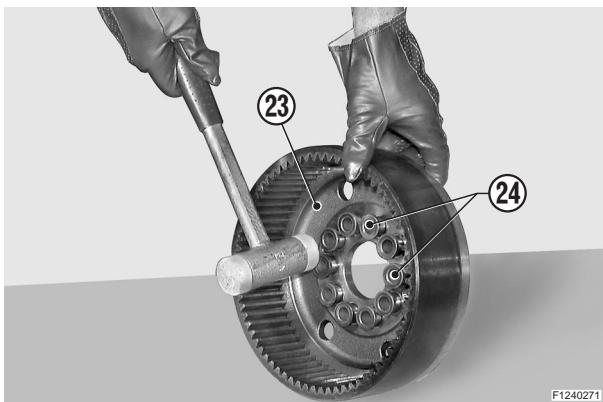
Coat the outer surface of the sealing ring (18) with sealant (Ermetico).

Position the sealing ring (18) inside the hub (15).
NOTE: Check the orientation of the ring (18).



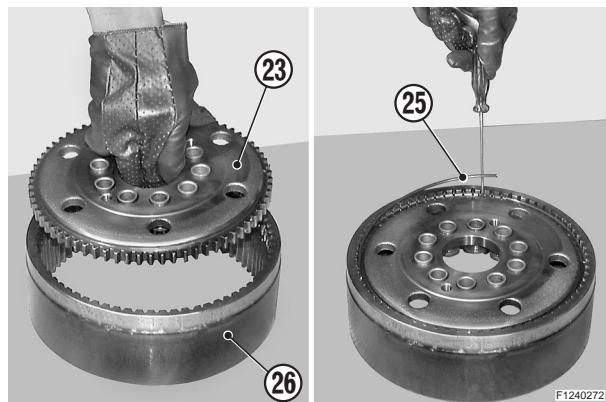
f

Position fixture T34 and press the sealing ring (18) into position.

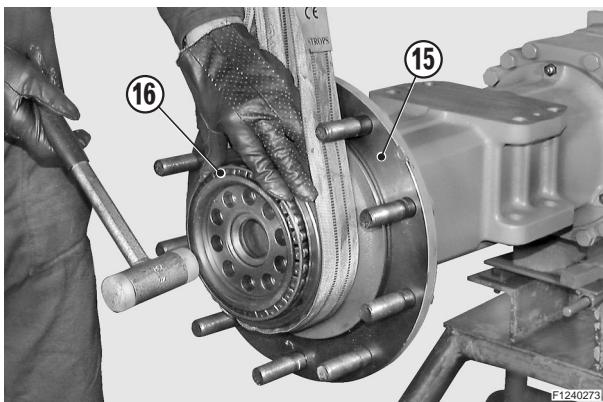

GB
a

Introduce the bushes (24) in the crown flange (23) - if they have previously been removed.

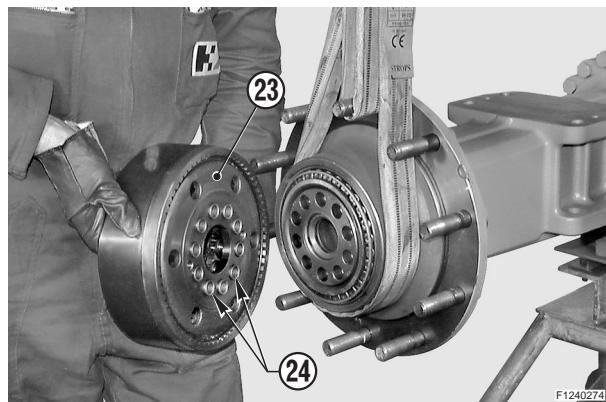
Push in the bushes so as to obtain a jut of 4mm, which can be used for centring.


GB
b

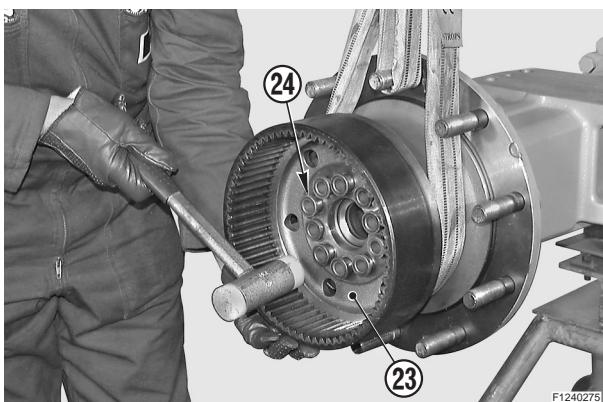
Insert the flange (23) in the crown (26) and lock into position by using the elastic ring (25).


GB
c

Lubricate the sealing ring (18) and the axle hub.
Install the hub (15) and the external bearing (16).

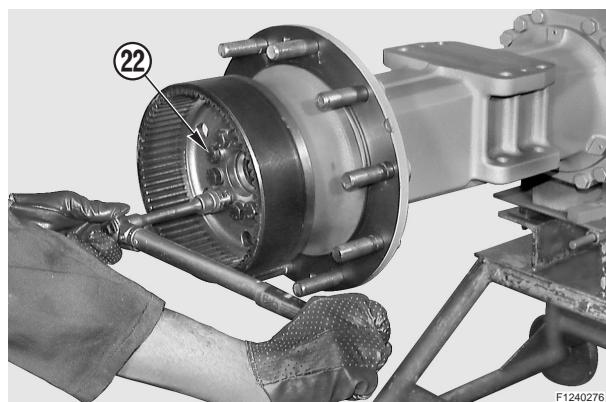

GB
d

Position the crown-carrier unit (23) by centring the bushes (24).


GB
e

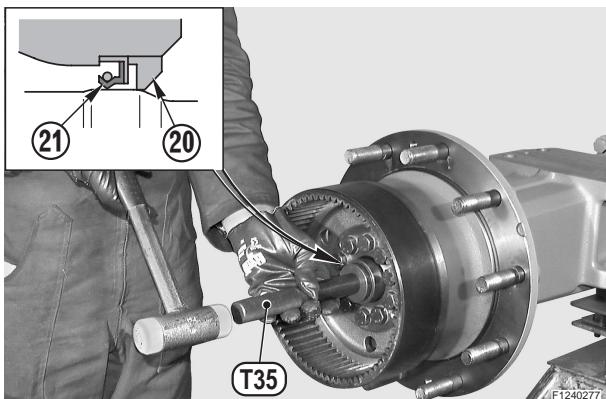
Insert the bushes (24) using a plastic mallet.

CAUTION! The bushes (24) should be inserted gradually and in a cross-over manner until the flange (23) is secured onto the axle hub.


GB
f

Insert the screws (22) and tighten by using the cross-tightening method.

Torque wrench setting : 220 – 230 Nm.

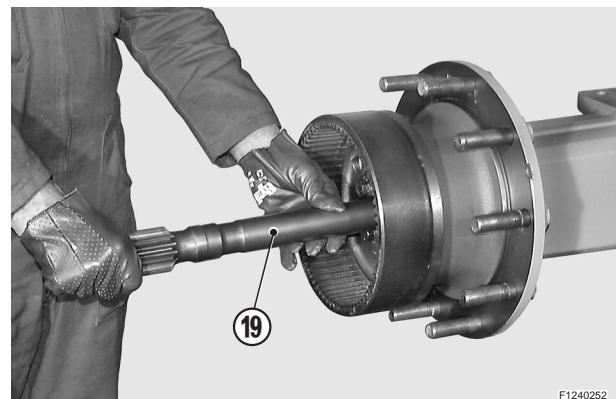


GB

a

Use the fixture **T35** to insert first the sealing ring (21), then the guide ring (20).

NOTE: Accurately check the assembly side.



GB

b

Lubricate the sealing ring (21) with oil and insert the axle all the way (19).

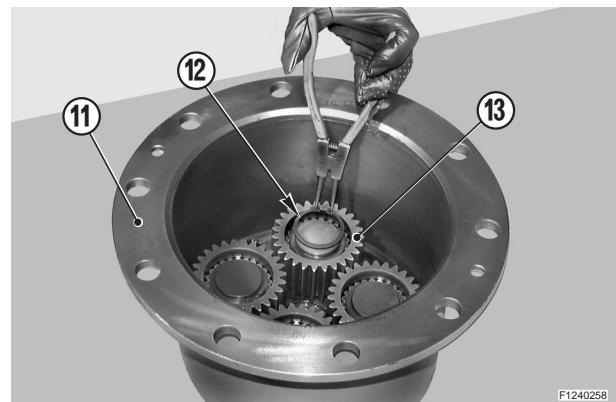
NOTE: After completing the final positioning of the axle, it is possible to discharge the pressure from the braking circuit.



GB

c

Install the shim washer of the axle (14) inside the spider cover (11).

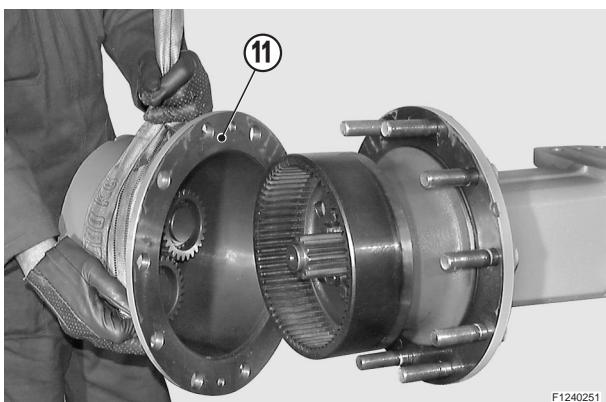


GB

d

Install the planet wheel gears (14) and the relative check rings (12) in the cover (11).

NOTE: Check assembly side of the planet wheel gears.

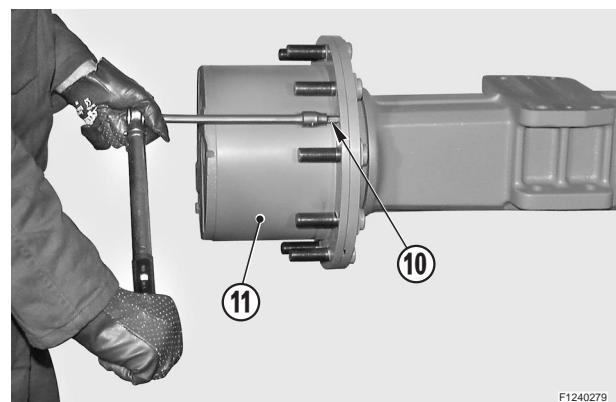


GB

e

Fit the spider cover (11) onto the hub (15).

CAUTION! Check condition and position of the O-ring (27).



GB

f

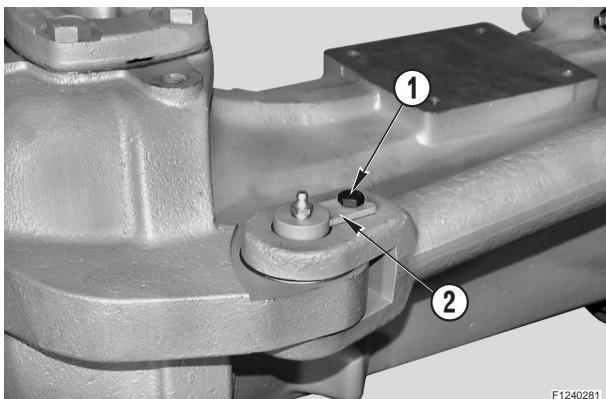
Lock the spider cover (11) by tightening the screws (10).
Torque wrench setting: 86–89 Nm.



SPICER CLARK-HURTH

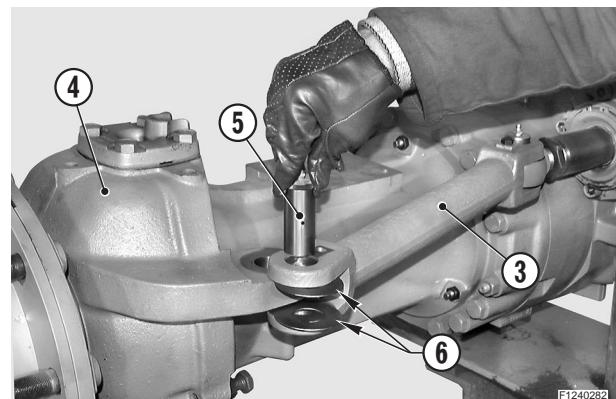
DRIVE AXLE TYPE

290



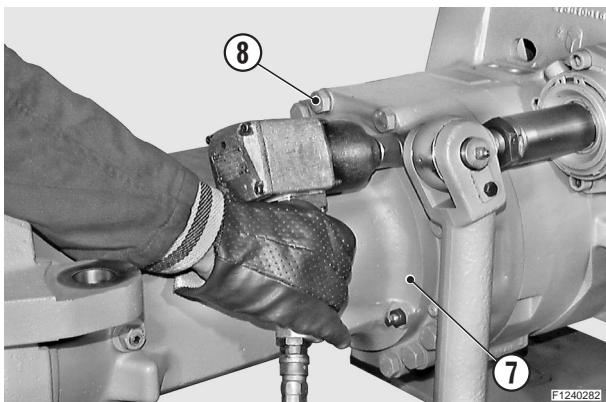
a

Remove the screw (1) and the plate (2).



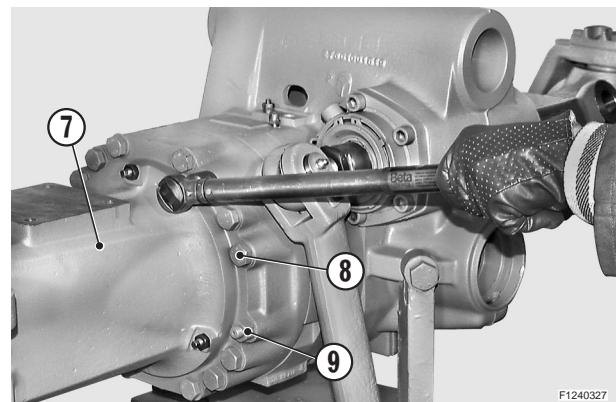
b

Disconnect the steering bar (3) from the articulation box (4) by removing the pin (5) and the shims (6).
NOTE: Note down the position of the shim rings (6).



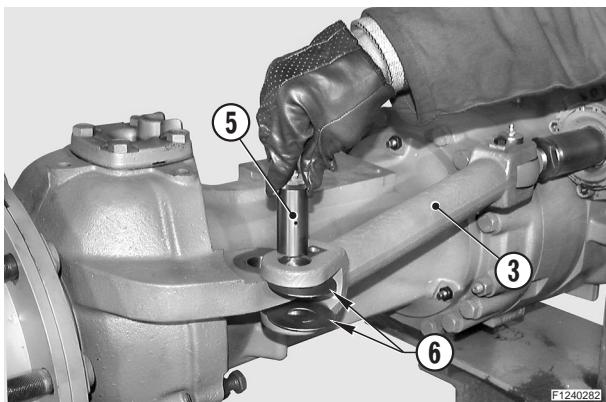
c

Sling the arm (7) and put the rod under slight tension.
 Undo and remove the screws (8), the nuts (9) and the relative washers.
 Remove the entire arm, including the braking disks (10).



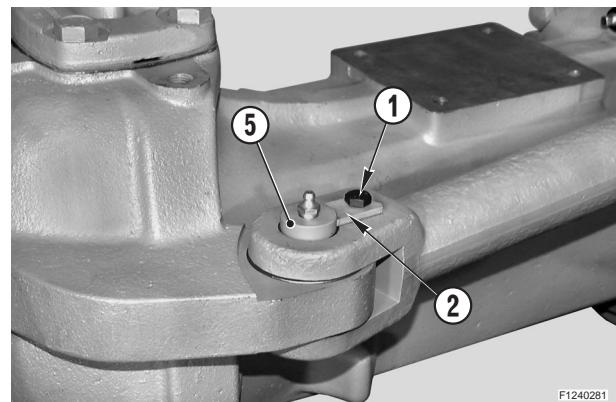
d

After inspecting or replacing the braking disks (10), re-install the arms (7) and check flatness.
 Lock the arms by using the cross-tightening method.
 Torque wrench setting for screws: 283 – 312 Nm.
 Torque wrench setting for nuts: 200 – 221 Nm.



e

Connect the steering bar (3) by inserting the shim rings (6) and the coupling pin (5).

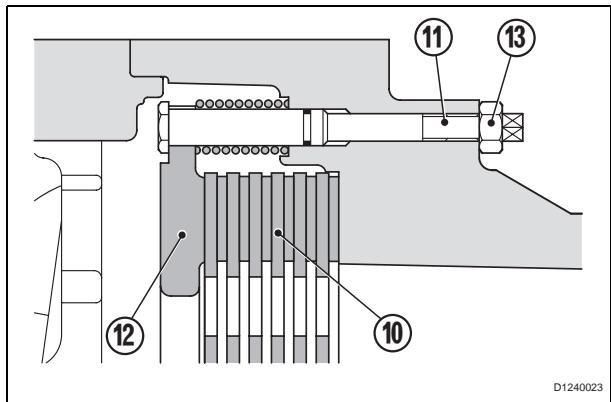


f

Lock the pin (5) with the plate (2) and the screw (1) treated with Loctite 270.
 Torque wrench setting for the screw: 52 – 58 Nm.



SLACK ADJUSTMENT FOR BRAKING DISCS

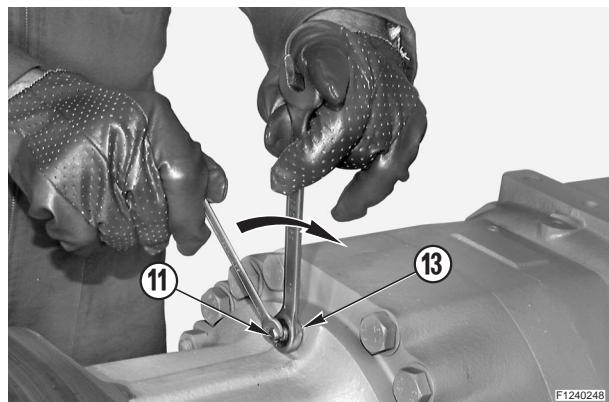


GB

a

Turn the adjusting screws (11) anti-clockwise until the disk push device (12) is made to rest on the braking disks (10).

CAUTION! Turn the screws evenly, up to a maximum torque of 2 Nm.



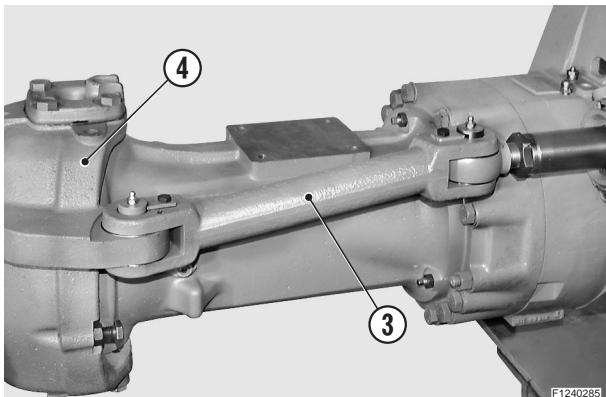
GB

b

Turn the screws (11) one turn clockwise so as to obtain a slack of 1 mm between the disks.

Lock the nut (13) while keeping the screws (11) into position.

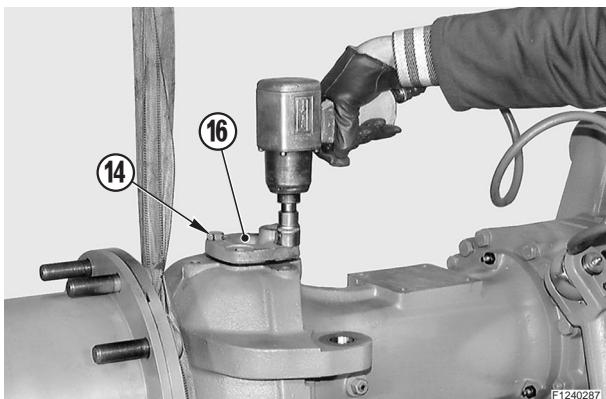
Torque wrench setting for the nut: MAX. 15 Nm.



a
GB
Disconnect the steering bar (3) from the articulation box (4). See "HOW TO REMOVE THE ARMS" for details.



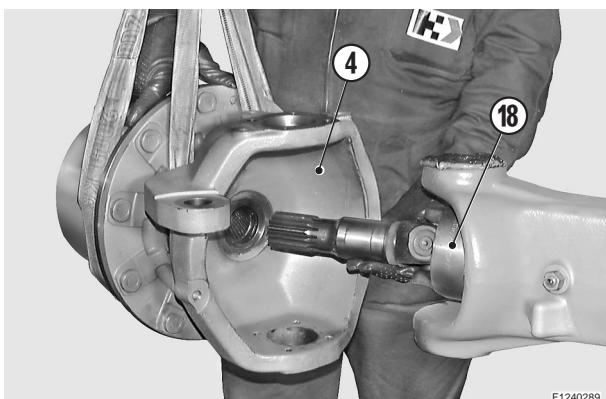
b
GB
Sling the entire articulation unit and put the rod under slight tension.
Remove the screws (14) and the bottom articulation pin (15).
NOTE: to ease removal, it may be necessary to insert two levers in the openings of the flange of the articulation pin.



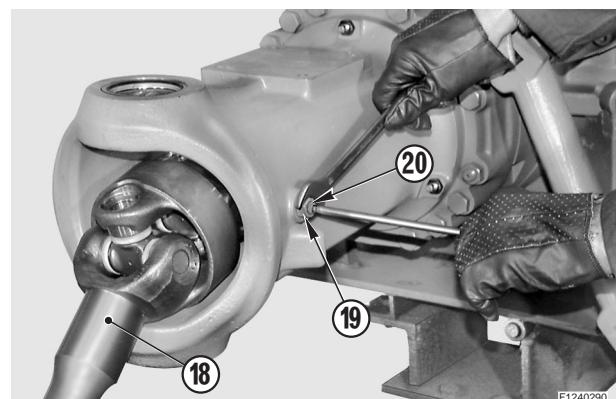
c
GB
Remove the check screws (14) of the top articulation pin (16).



d
GB
Remove the top articulation pin (16) by inserting two levers in the openings of the flange of the articulation pin. Also, remove the shims (17).
NOTE: Pay attention not to damage surfaces and shims (17).



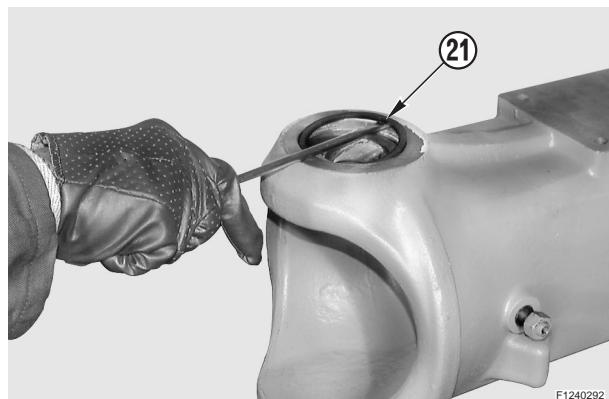
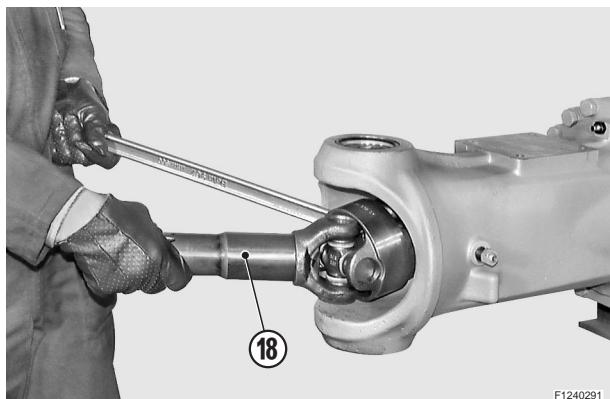
e
GB
Extract the entire articulation unit (4) from the u-joint(18).



f
GB
Introduce pressure into the braking circuit to lock the braking disks (10).
Unloose the nut (19) and unscrew the check dowel (20) of the u-joint (18).



HOW TO REPLACE U-JOINT SEALS, ARTICULATION PINS AND BUSHES - DISASSEMBLY



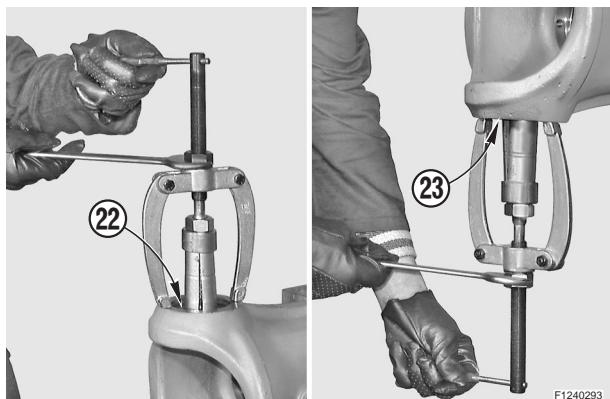
GB

With the aid of a lever, extract the u-joint (18).

a

GB

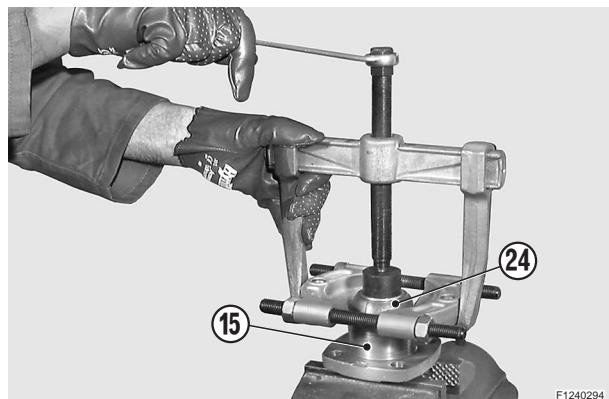
Remove top and bottom seals (21).
NOTE: 1. Note down the assembly side.
2. Clean out the seats by removing any sealant residue.



GB

Extract the top bush (22) and the lower spherical seat (23) using an extractor for inner parts.

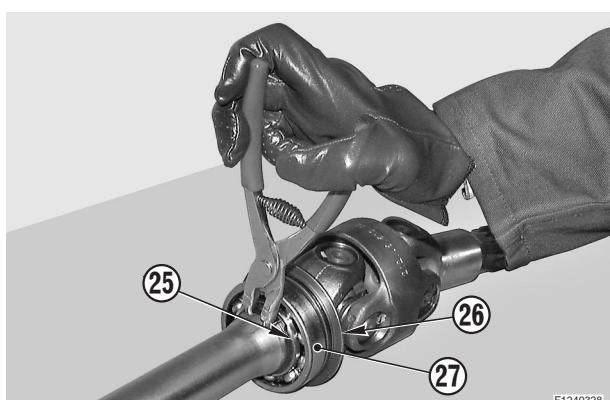
c



GB

If the spherical cap (24) needs replacing, remove the cap from the lower articulation pin (15).

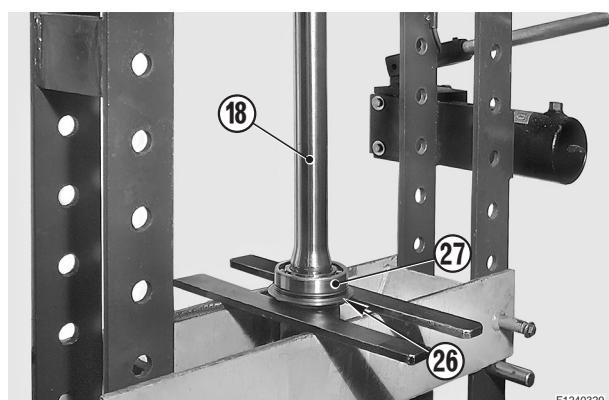
d



GB

Remove the elastic check ring (25) of bearing and flange (26).

e



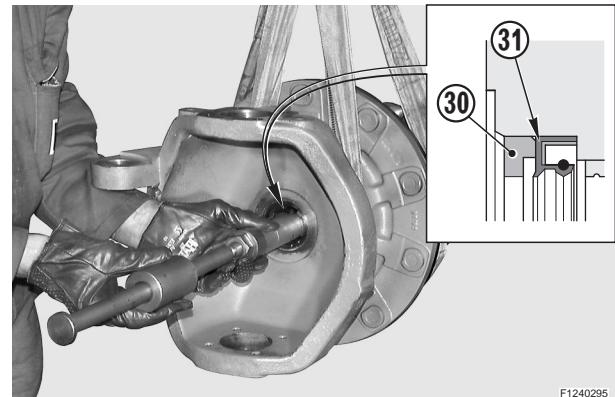
GB

Position the complete u-joint (18) under a press and remove the bearing (27) and the flange (26) at the same time.

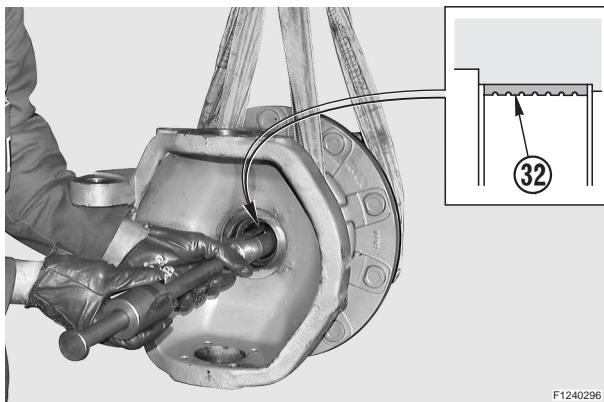
f

**a**

Extract the sealing ring (28) from the flange (26).
NOTE: Note down the assembly side.

**GB****b**

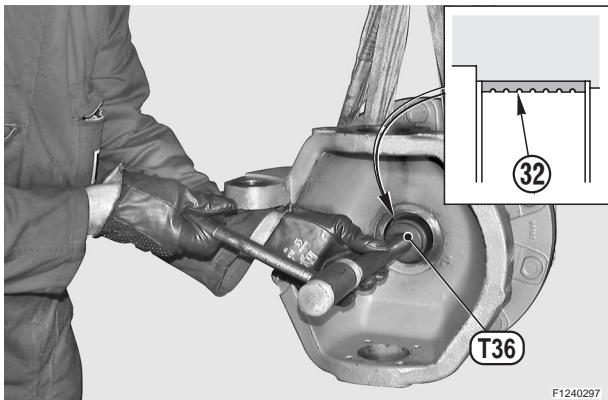
Remove the centring ring (30) and the sealing ring (31) from the articulation unit by using an extractor for inner parts.
NOTE: Note down the assembly side of sealing ring (31) and centring ring (30).

**C**

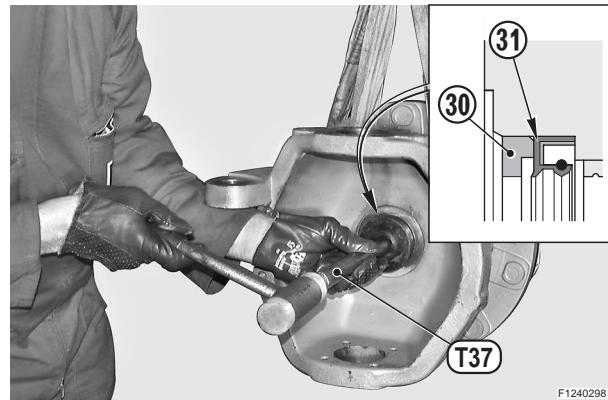
Extract the bearing (32).



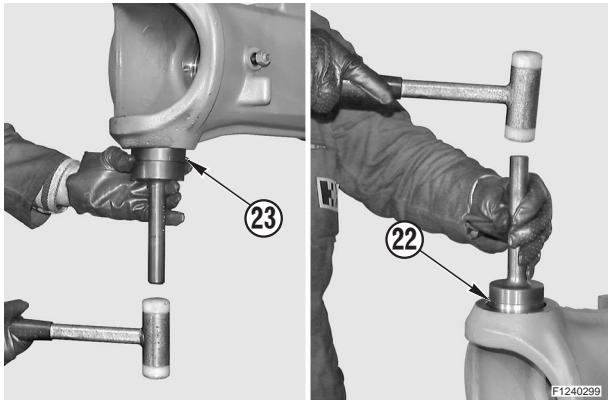
HOW TO REPLACE U-JOINT SEALS, ARTICULATION PINS AND BUSHES - ASSEMBLY

**GB****a**

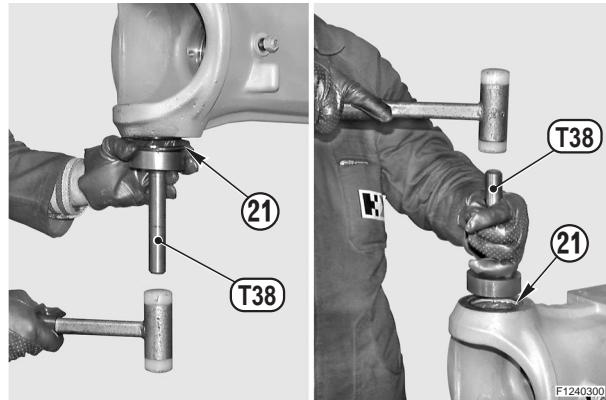
Lubricate the seat and install the bearing (32) using fixture T36.

**GB****b**

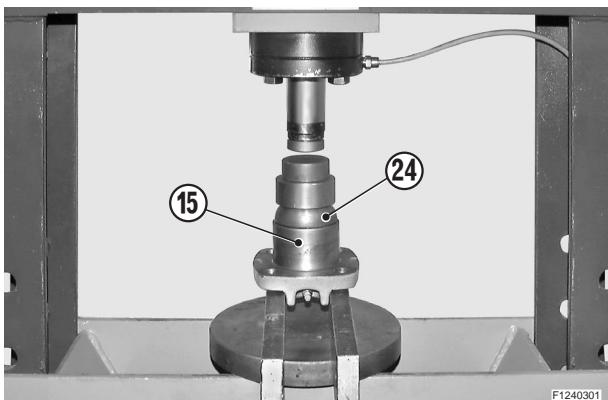
Lubricate the outer surfaces of sealing ring (31) and centring ring (30).
Slot them into position, using fixture T37.

**GB****c**

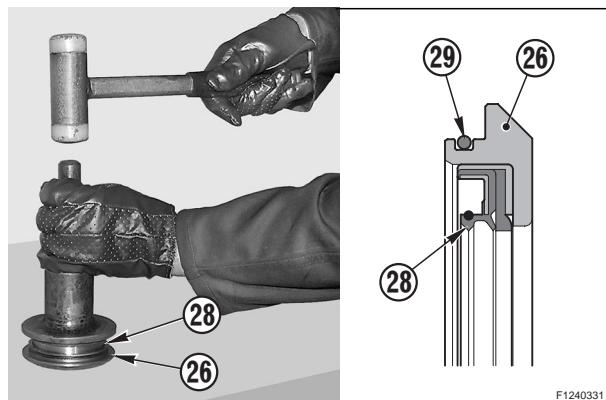
Install the top bush (22) and the bottom spherical seat (23), using an extractor.

**GB****d**

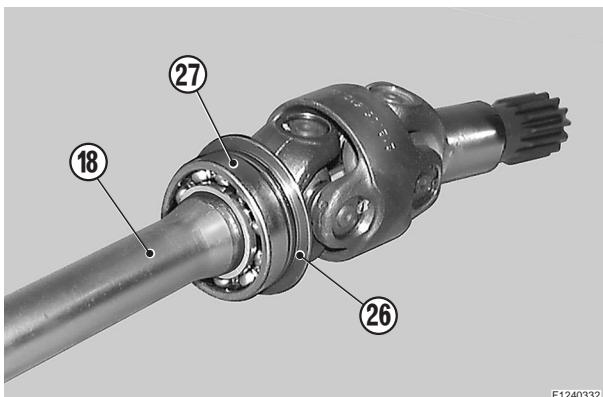
Apply Loctite 641 to the outer surface of seals (21) and, using fixture T38, slot them into position.
NOTA: Accurately check assembly side.

**GB****e**

If the spherical cap (24) has been removed, fit the new cap onto the bottom articulation pin (15).
Use a press for assembly.

**GB****f**

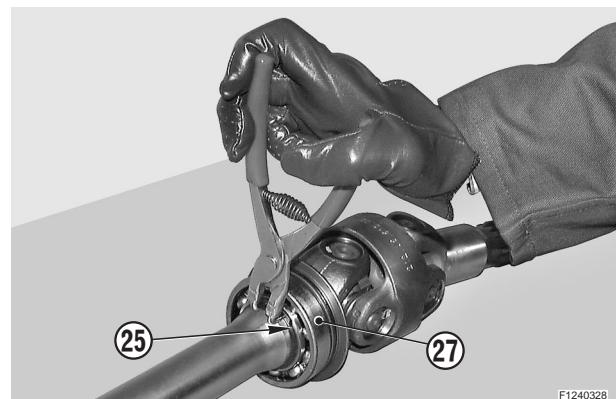
With the aid of extractor, insert the sealing ring (28) of the shaft in the flange (26).
NOTE: accurately check the assembly side.
Also replace the outer O-ring (29).



a

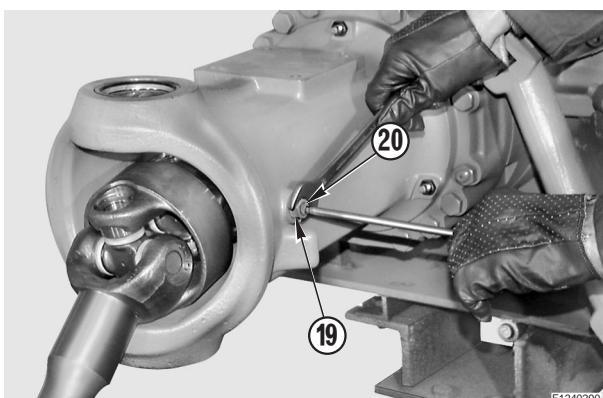
GB

Insert the flange (26) into the u-joint (18). Heat up the bearing (27) at about 100 °C, then insert it in the u-joint and secure it.



b

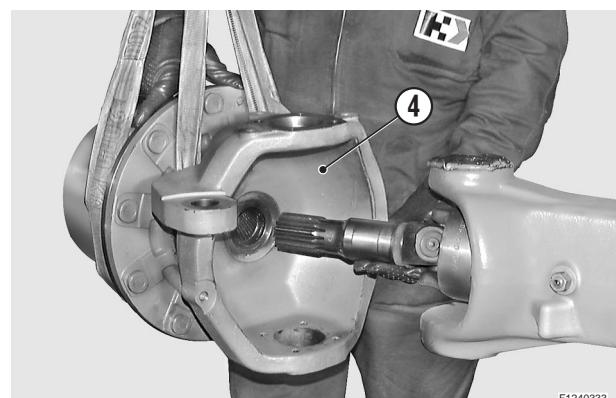
Fit the elastic check ring (25) of the bearing (27).



c

GB

Insert the u-joint until the flange (26) is secured. Tighten the dowel (20) using a torque wrench setting of 15 Nm MAX. Lock into position by tightening the nut (19). Torque wrench setting: 86–89 Nm. **NOTE:** After fixing the u-joint, discharge the pressure from the braking circuit.



d

GB

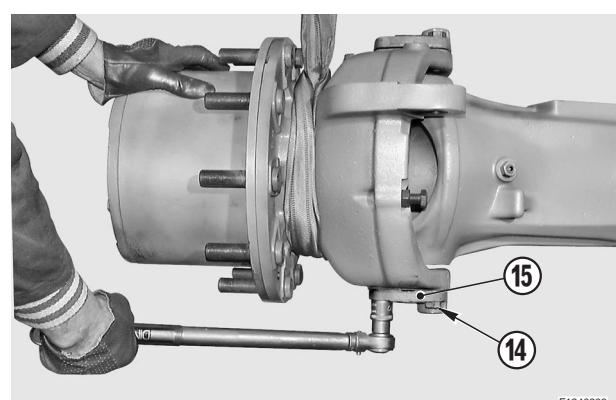
Grease the inside of both sealing ring (31) and bearing (32). Insert the articulation unit (4) in the u-joint (18).



e

GB

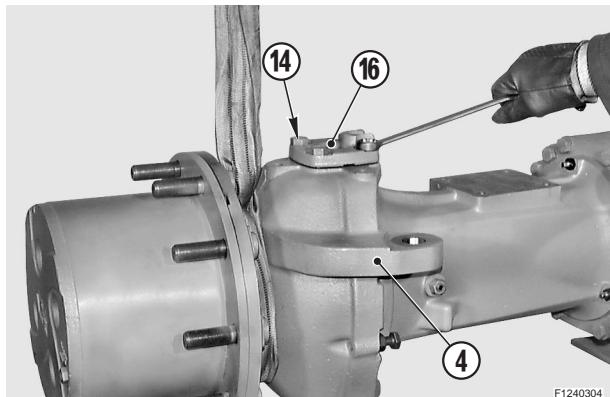
Install the top articulation pin (16) without the shims and temporarily keep it into position with the screws (14).



f

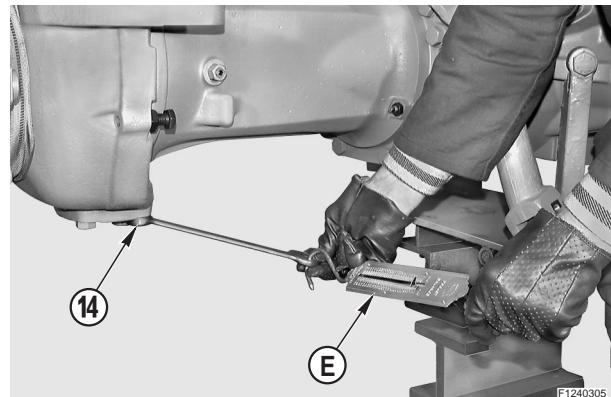
GB

Lubricate the bottom articulation pin (15) with Molikote and lock it into its final position with the screws (14). Torque wrench setting: 220–240 Nm.

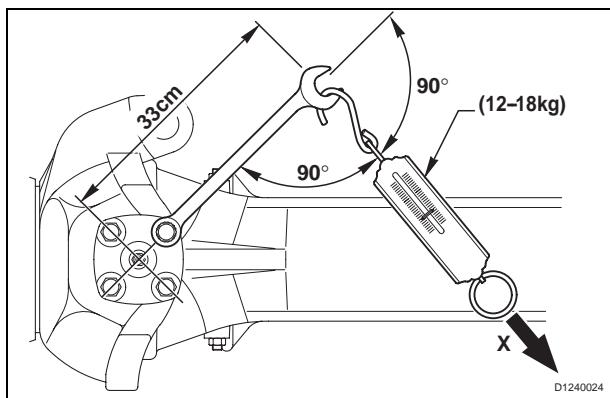

GB
a

Provisionally tighten the screws (14) of the top pin (16) in an even way, using the cross-tightening method and simultaneously checking the torque of the articulation unit.

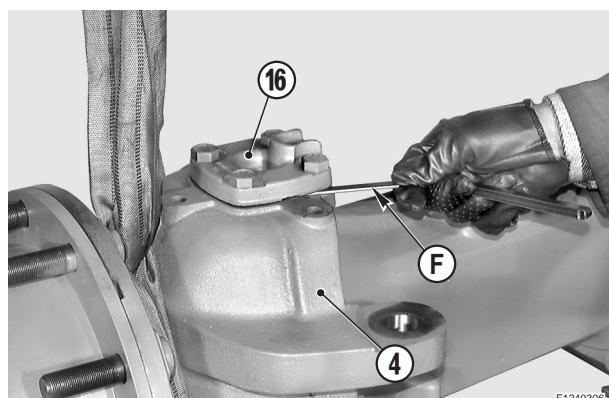
Tighten the screws (14) until the articulation reaches a torque of 40–60 Nm.


GB
b

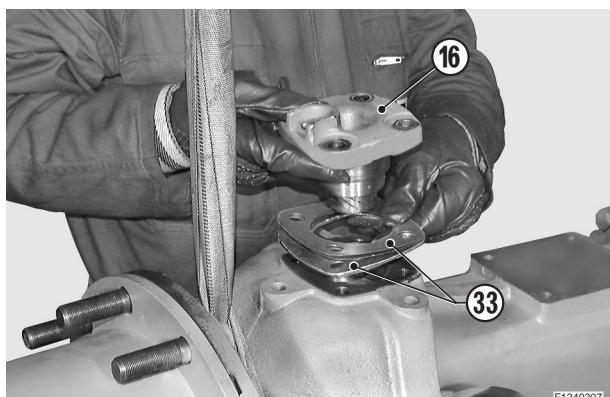
To check the torque of the articulation unit, apply a wrench to one of the screws (14) and connect it to a spring dynamometer "E".


GB
c

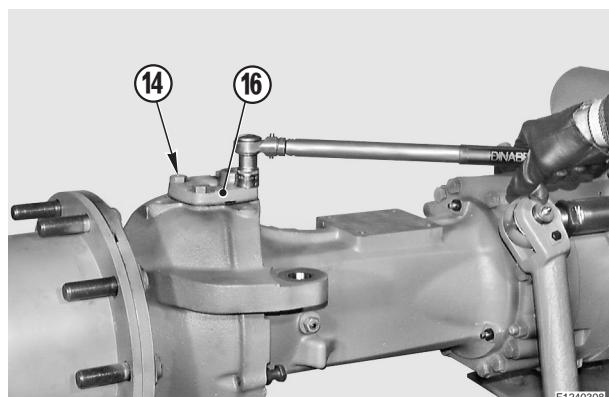
The force "X" which should be applied to the dynamometer with an arm measuring about 33 cm from the rotation centre is 12–18 kg.


GB
d

By means of a feeler gauge "F", measure the slack between the articulation pin (16) and the articulation box (4).


GB
e

After defining shim requirements, remove the top articulation pin (16), lubricate it with Molikote and re-install it by inserting the shims (33).

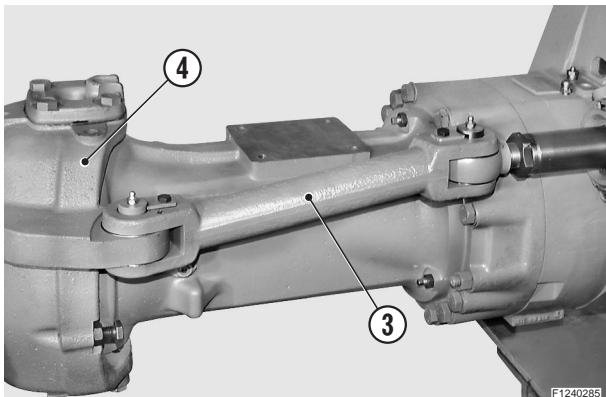

GB
f

Tighten the screws (14) by cross-tightening and lock the pin (16).
Torque wrench setting: 220–240 Nm.

HOW TO DISASSEMBLE THE EPICYCLIC REDUCTION GEAR



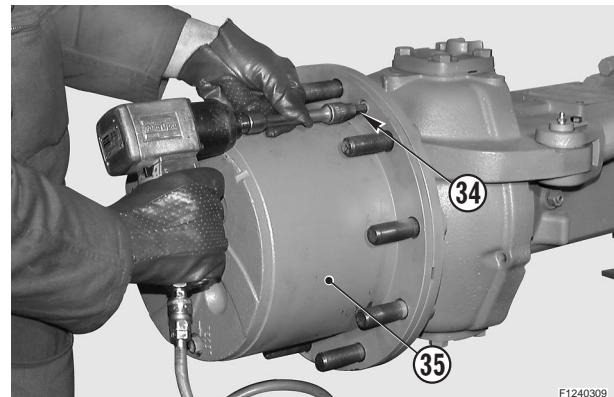
SPICER CLARK-HURTH



GB

a

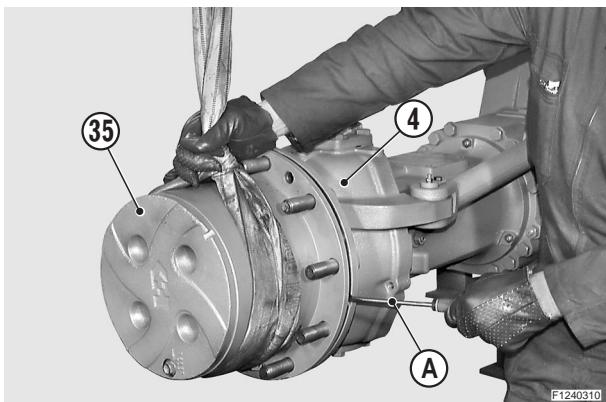
Disconnect the steering bar (3) from the articulation box (4). See "HOW TO REMOVE THE ARMS" for details.



GB

b

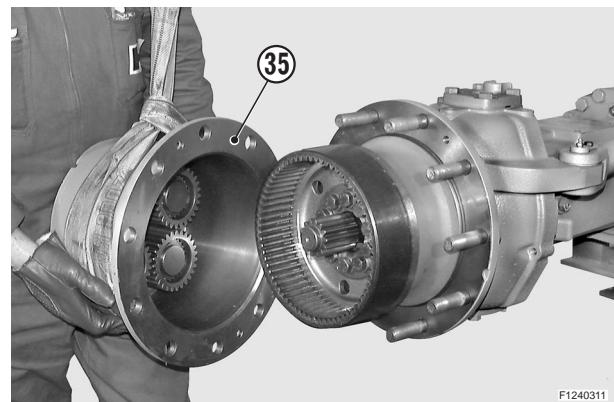
Remove the fastening screws (34) from the spider cover (35).



GB

c

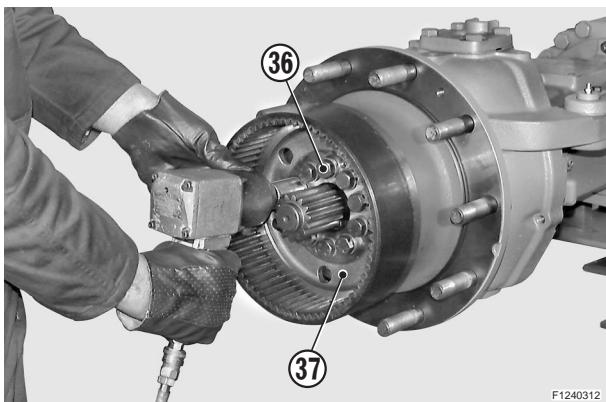
Detach the spider cover (35) from the articulation box (4) inserting a screwdriver "A" alternately in the specific slots.



GB

d

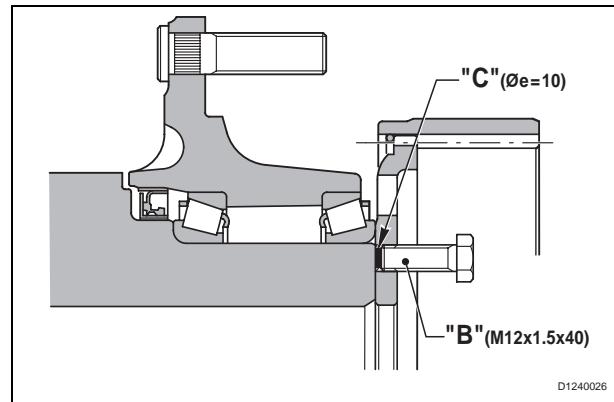
Sling the entire spider cover (35) and remove it completely.



GB

e

Unloose and remove the screws (36) from the crown flange (37).
NOTE: Leave a screw (36) on the top for safety's sake.



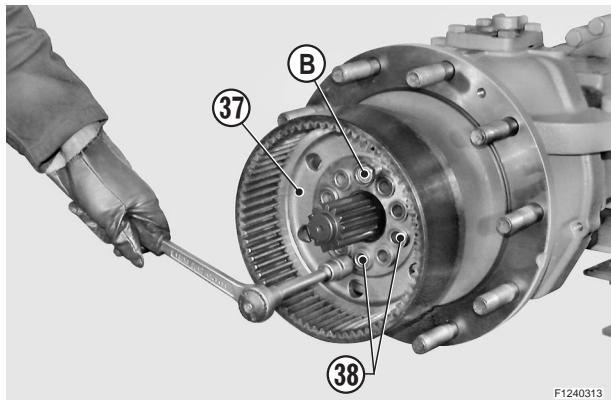
GB

f

To extract the crown flange (37), insert two flat washers "C" $\text{Øe} = 10$ and fix two screws "B" (M12x1.5x40) in the appropriate holes. Keep washers into position by applying grease.
CAUTION! Be sure that the end of the threaded stem is perfectly flat.



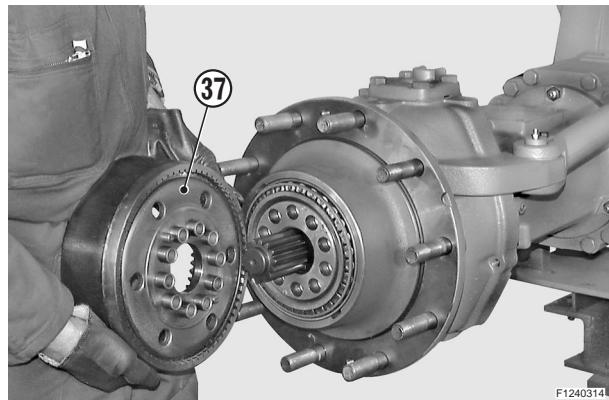
HOW TO DISASSEMBLE THE EPICYCLIC REDUCTION GEAR



GB

a

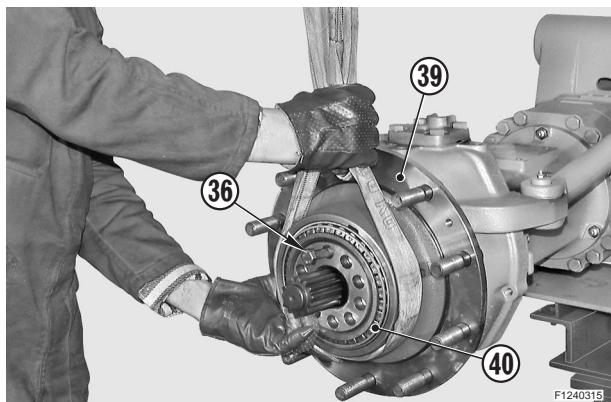
Alternately turn the two screws "B" one fourth turn until the bushes (38) of the crown flange (37) are released.



GB

b

Remove the screw (36) which has been left on for safety and remove the crown flange (37).

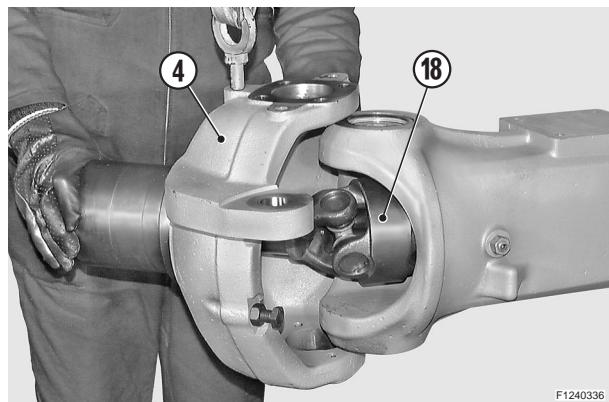


GB

c

Sling the entire hub (39) and, using a plastic mallet, extract the whole unit from the axle.

NOTE: Insert a screw (36) to prevent the bearing from falling (40).



GB

d

Screw down an eyebolt in the articulation box (4) and connect it to a piece of hoisting equipment.

Remove the articulation pins (15) and (16) and extract the articulation box (4) from the u-joint (18).

NOTE: See "HOW TO REPLACE U-JOINT SEALS" for details about the removal of articulation pins and u-joints.

HOW TO DISASSEMBLE UNITS

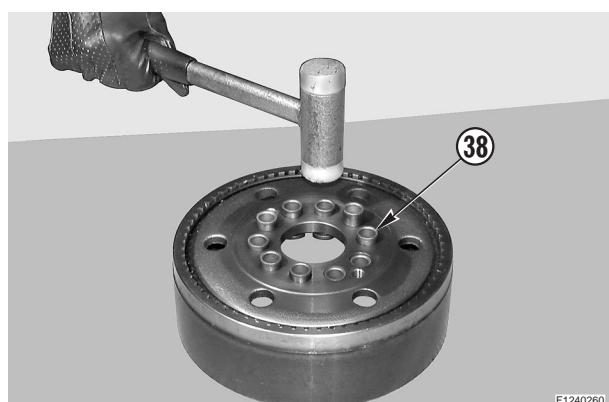


GB

e

Remove the elastic rings (41) and extract the planet wheel gears (42) - including the bearings - from the spider cover (35).

NOTE: Note down the assembly side.

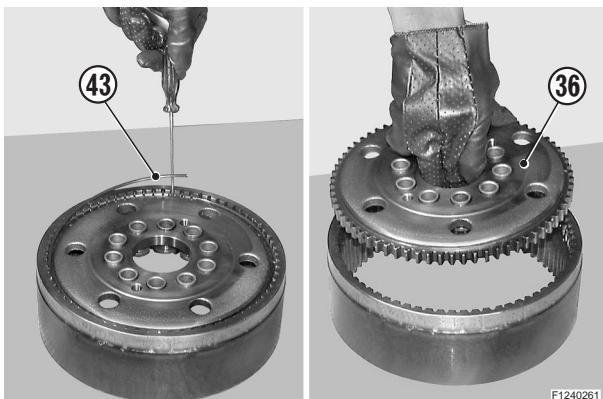


GB

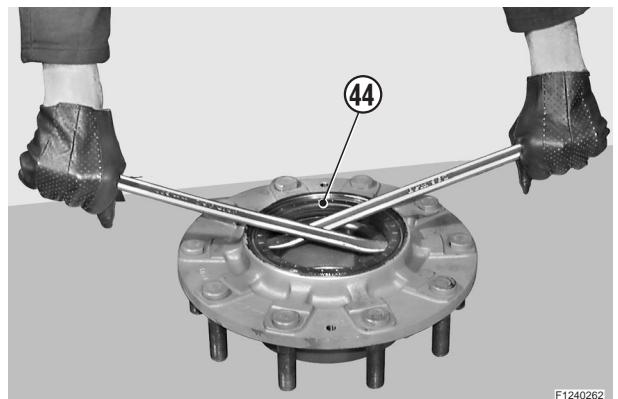
f

If necessary, remove the bushes (38) using a plastic mallet (and a pushing device, as the case may be).

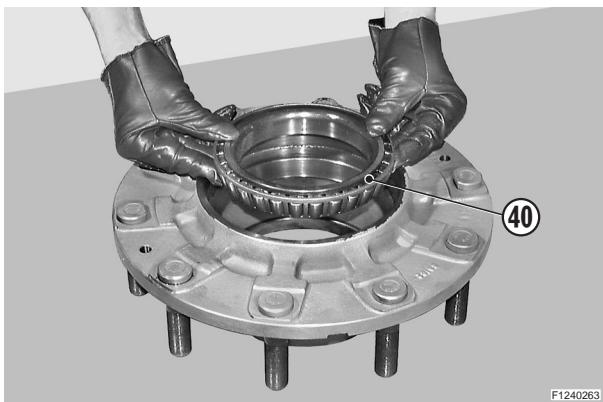
NOTE: Partially extract the bushes (38) anyhow.

**a**

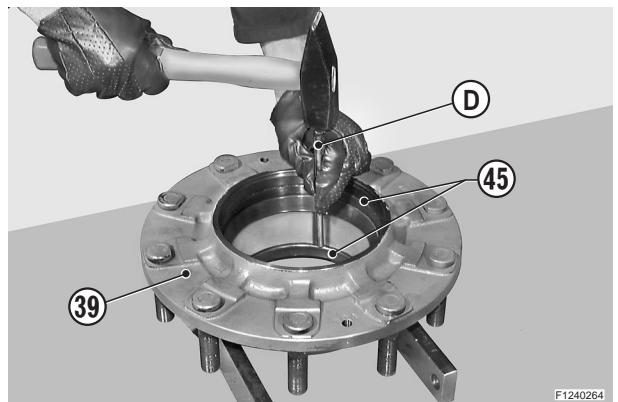
Remove the elastic ring (43) and the flange (36).

**GB****b**

Remove the sealing ring (44).
NOTE: Note down the assembly side.

**c**

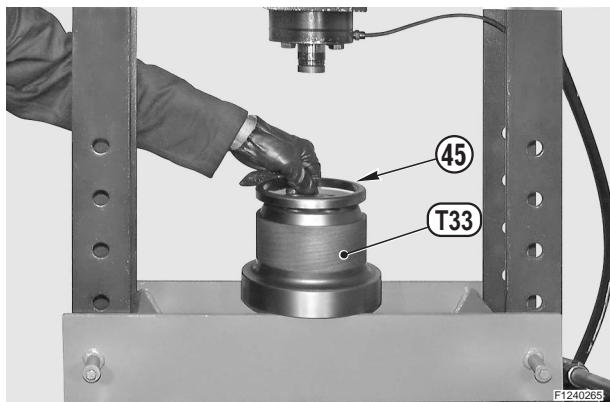
Remove the internal bearing (40).

**GB****d**

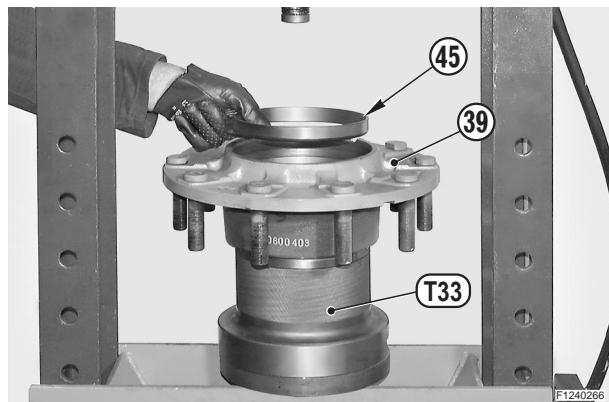
Remove the external thrust blocks (45) of the bearings by inserting a pin-extractor "D" in the specific slots placed on the hub (39).
NOTE: Alternate hammering to avoid crawling and deformation of the thrust blocks.



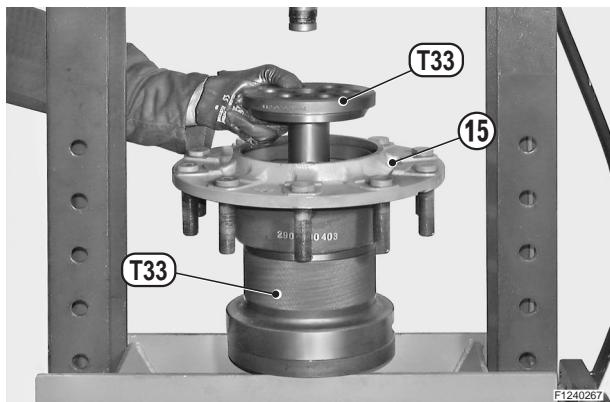
HOW TO ASSEMBLE THE EPICYCLIC REDUCTION GEAR

**GB****a**

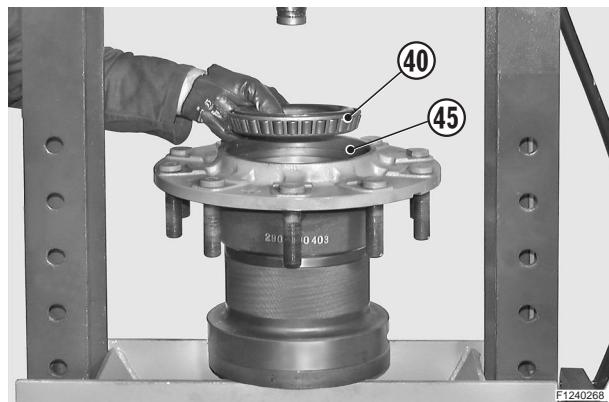
Position the lower part of fixture T33 and the thrust block (45) of the external bearing under the press.

**GB****b**

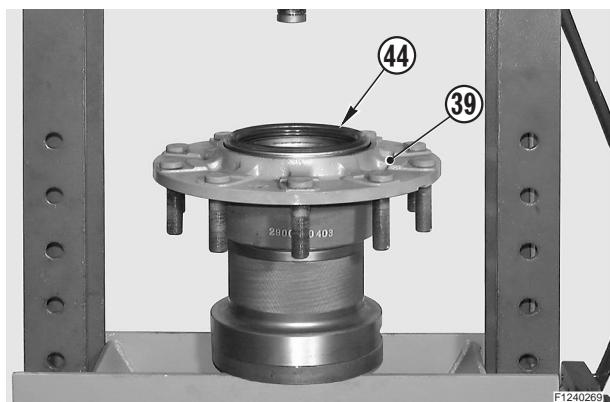
Lubricate the seats of the bearings and position the hub (39) on the fixture T33; position the thrust block (45) of the internal bearing.
NOTE: Check the orientation of the thrust block.

**GB****c**

Position the top part of fixture T33 and press down the thrust blocks (45) into the hub (39) all the way.

**GB****d**

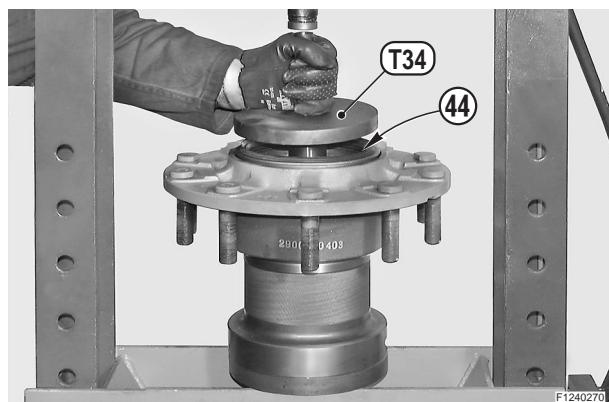
Install the bearing (40) in the internal thrust block (45).

**GB****e**

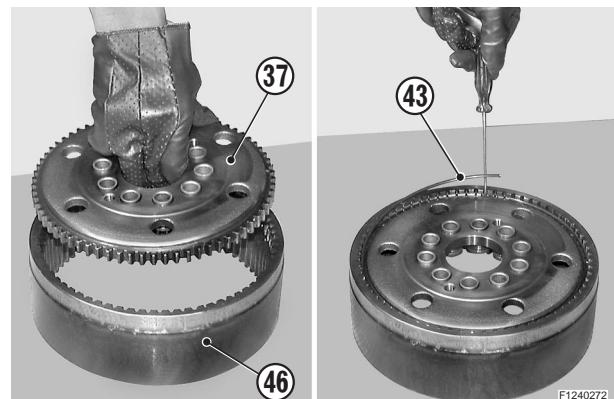
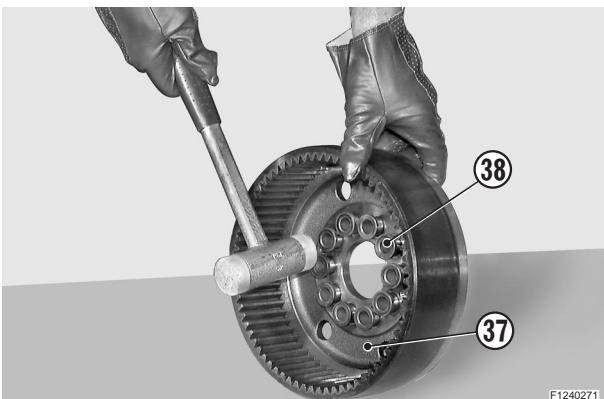
Coat the outer surface of the sealing ring (44) with sealant (Ermectico).

Position the sealing ring (44) inside the hub (39).

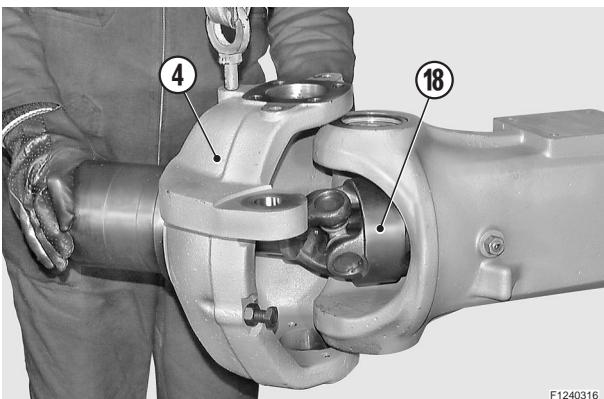
NOTE: Check the orientation of the ring (44).

**GB****f**

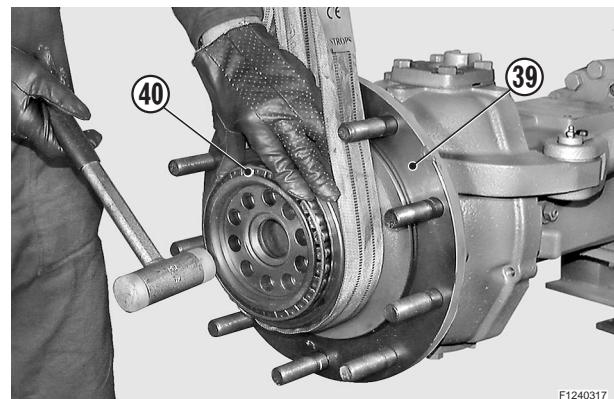
Position fixture T34 and press the sealing ring (44) into position.

**GB****a**

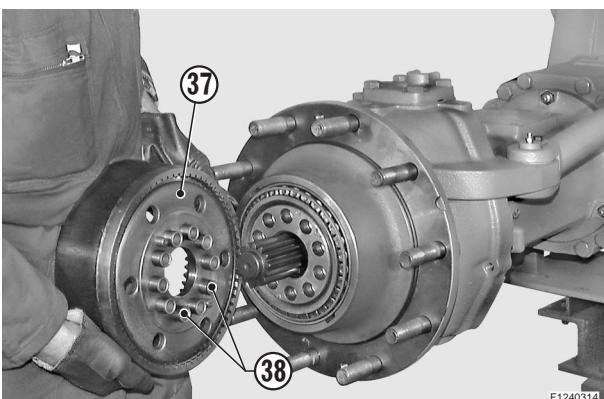
If the bushes (38) have been removed, position the bushes in the crown flange (37).
Insert bushes so as to obtain a jut of 4mm which can be used for centring.

**GB****c**

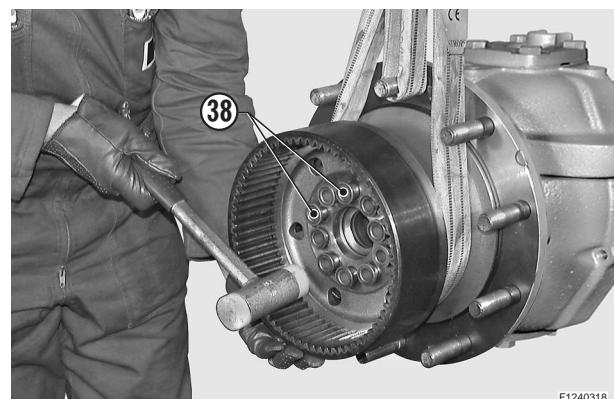
Insert the articulation box (4) in the u-joint (18) and fit the articulation pins (15) and (16).
See "HOW TO REPLACE U-JOINT SEALS" for details.

**GB****d**

Lubricate the sealing ring (44) and the hub of the articulation box.
Install the hub (39) and the external bearing (40).

**GB****e**

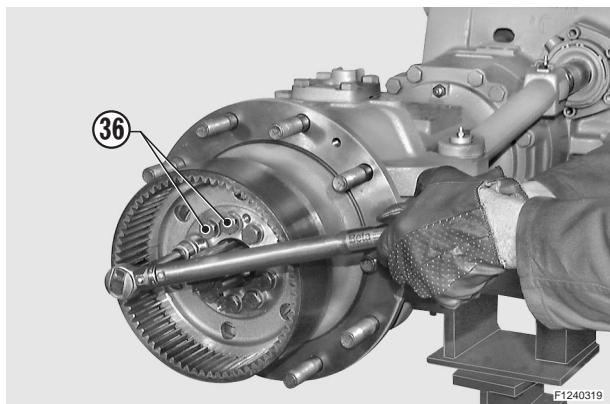
Position the crown unit (37), centring the bushes (38).

**GB****f**

Insert the bushes (38) using a plastic mallet.
CAUTION! The bushes (38) should be inserted gradually and in a cross-over manner until the flange (37) is secured onto the hub of the articulation box (4).



HOW TO ASSEMBLE THE EPICYCLIC REDUCTION GEAR



GB

a

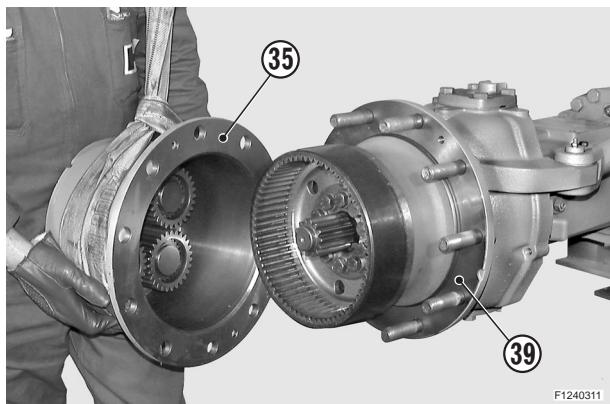
Insert the screws (36) and tighten using the cross-tightening method.
Torque wrench setting: 220 – 230 Nm.



GB

b

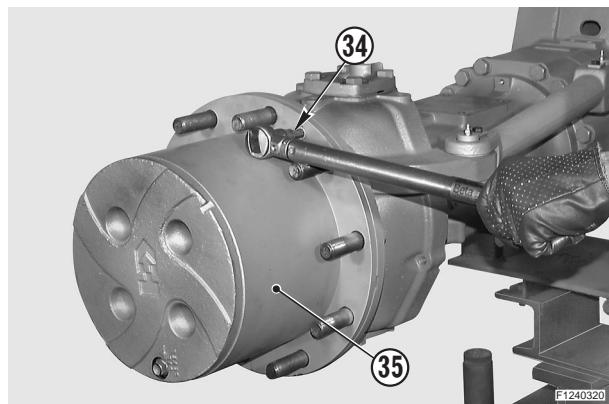
Insert the planet wheel gears (42) in the cover (35) as well as the relative check rings (41).
NOTE: Check the assembly side of planet wheel gears (42).



GB

c

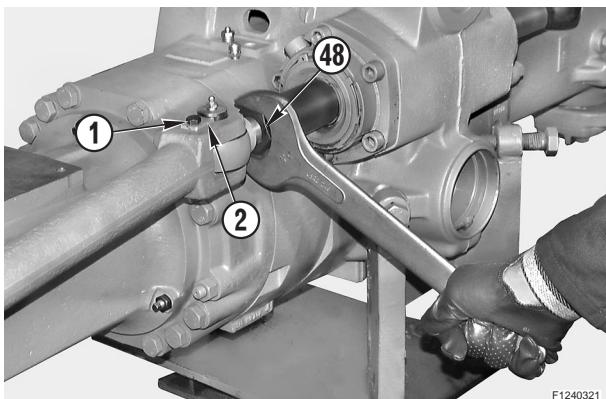
Install the spider cover (35) onto the hub (39).
CAUTION! Check condition and position of the O-ring (47).



GB

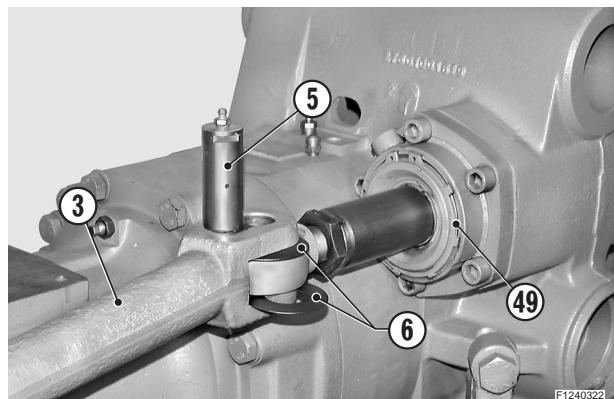
d

Lock the spider cover (35) with screws (34).
Torque wrench setting: 86 – 89 Nm.



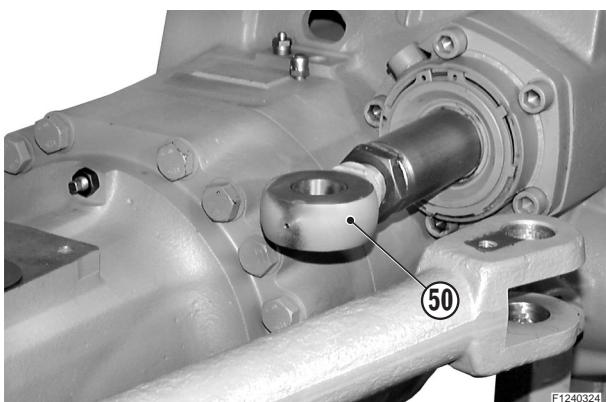
a

Heat the nuts (48) at approximately 100 °C and unscrew them up to the limit stop.
Remove the screws (1) and the plates (2).



b

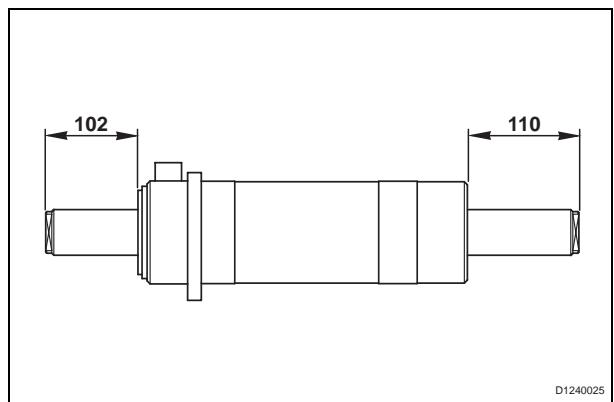
Remove the pins (6) connecting the cylinder (49) and the steering bar (3).
Also remove the shim rings (6).
NOTE: Note down the position of the shim rings.



c

c

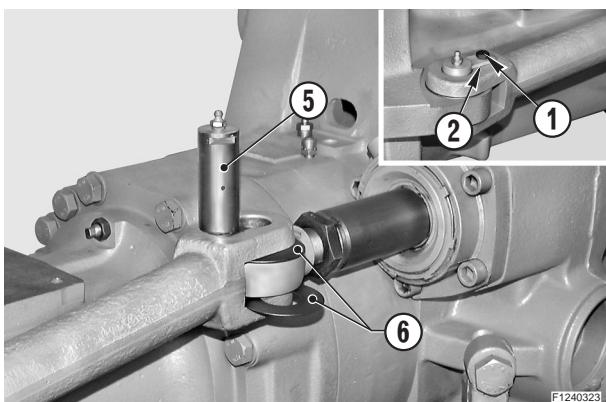
Turn the eye-connections (50) one at a time in order to adjust convergency.
CAUTION! Turn eyes evenly to maintain the centring of the stroke.



d

d

CAUTION! If the eye-connections (50) or the steering cylinder (49) are replaced, check that convergency is correct when the stem of the piston shows the juts indicated in the drawing.



e

e

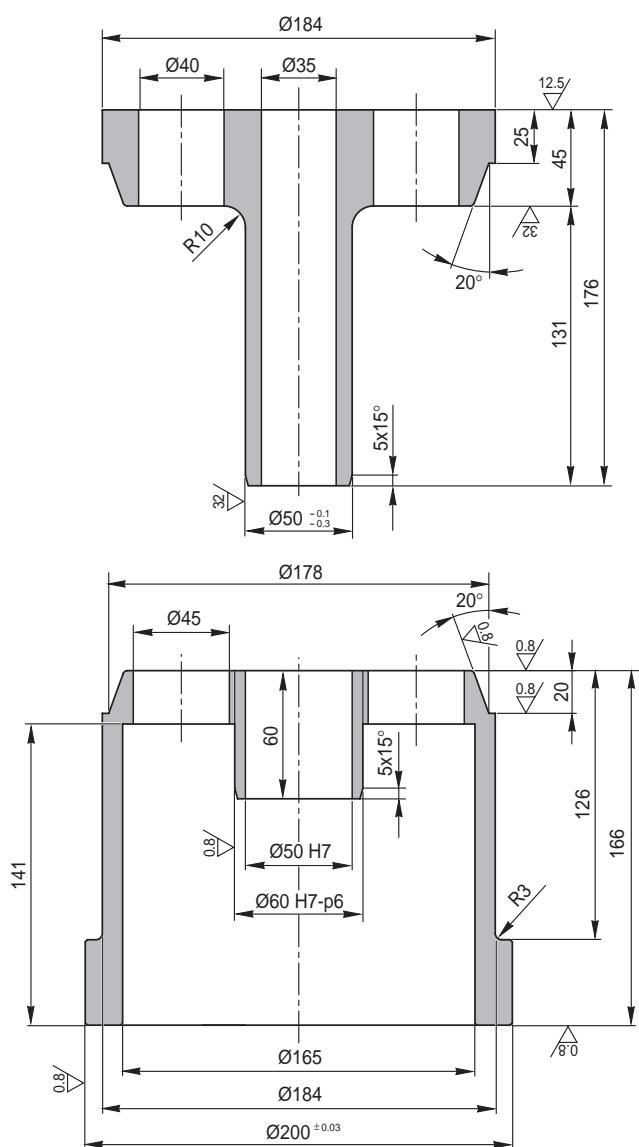
Tie the tension rods to the steering cylinder again and insert the pins (5) and the shim rings (6).
Lock the pins with the screws (1) treated with Loctite 270 and the plates (2).
Torque wrench setting for screws: 52–58 Nm.



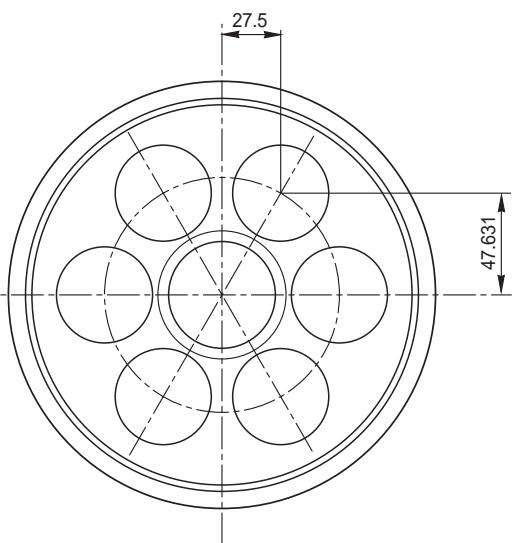
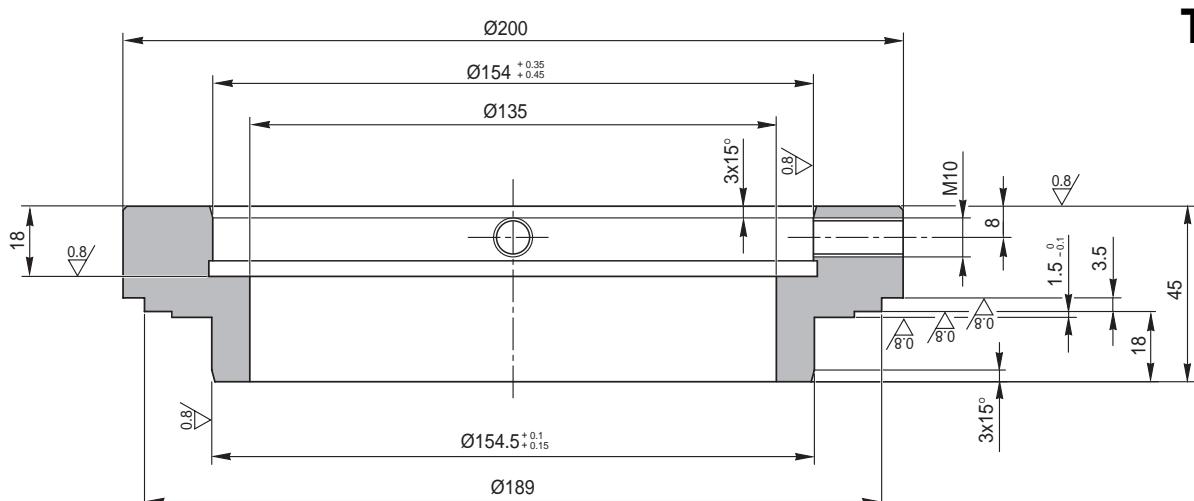
f

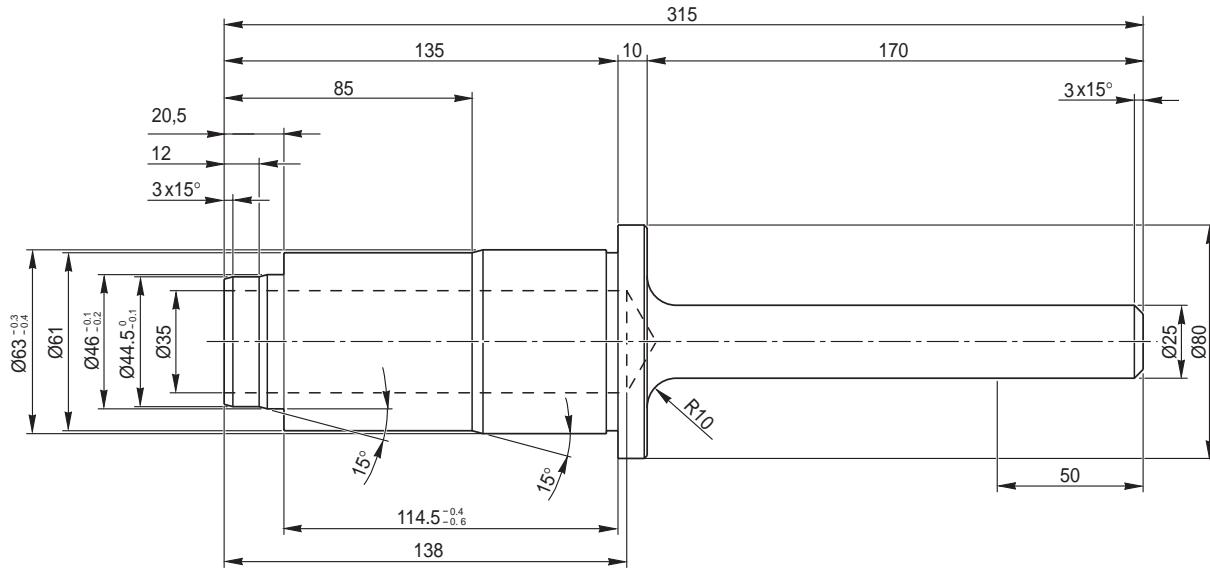
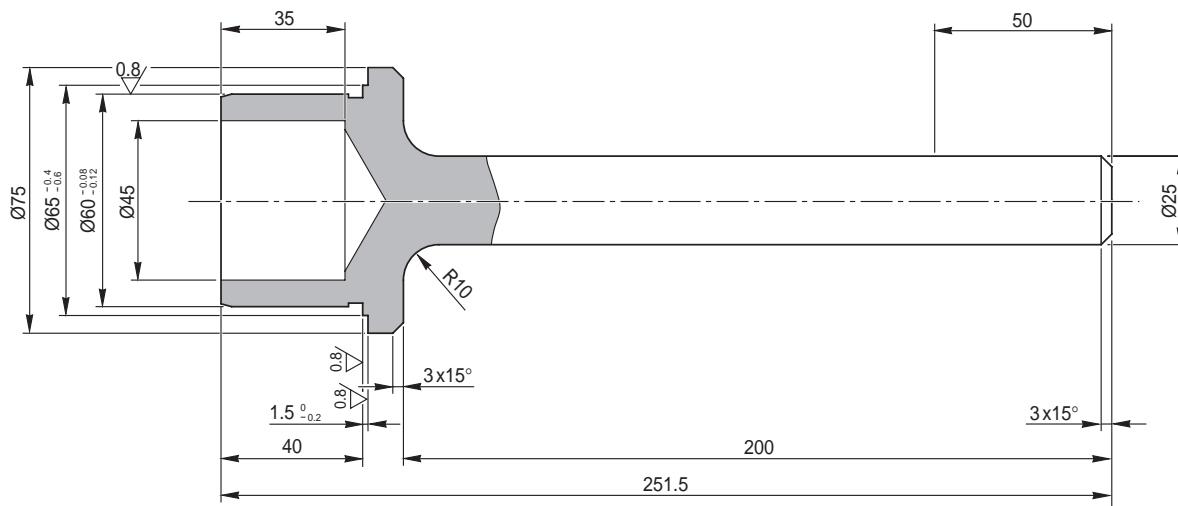
f

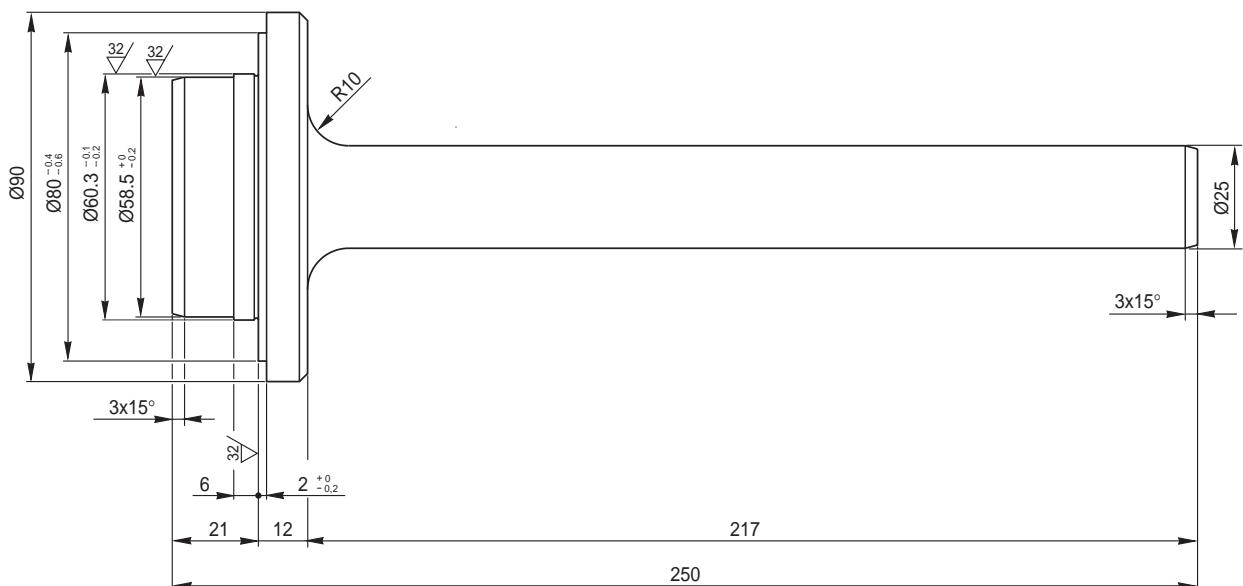
Apply Loctite 270 to the thread of the eye-connections (50) and lock the nuts (48).
Torque wrench setting for nuts: 350–360.

T33

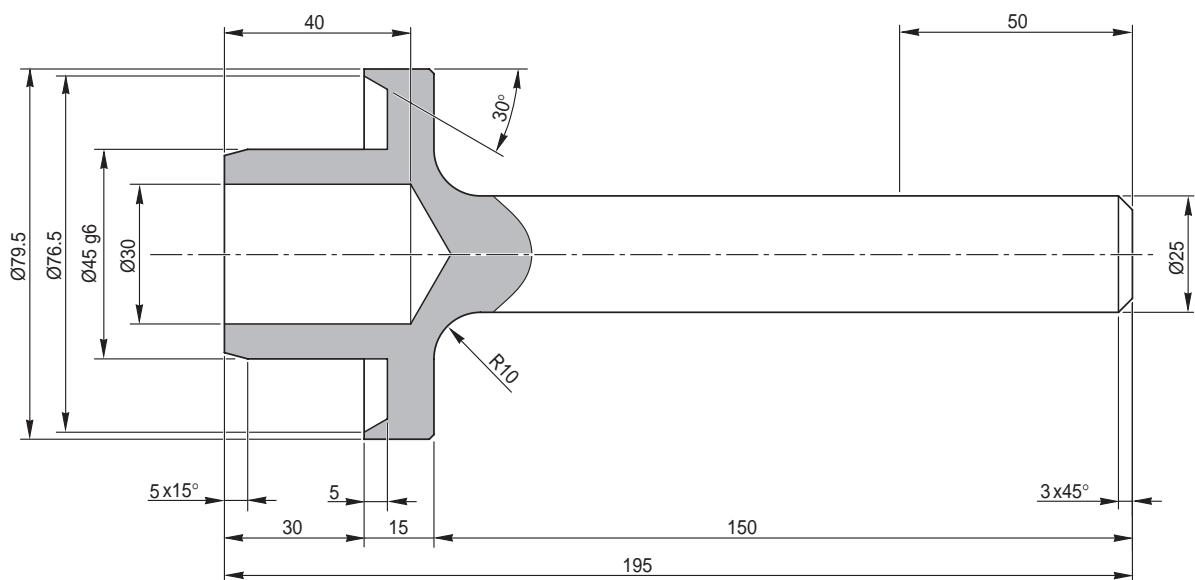
D1240024
660.38.3265

**T34**D1240025
660.38.3281

T35

660.38.3059
T36

660.38.3348

T37

D1240022

660.38.1945**T38**

D1240021

660.38.3441

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